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PAPER TRADE JOURNAL

JUNE 29, 1944

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IS IT RIGHT TO TALK OR THINK OF PLANS FOR POST-WAR

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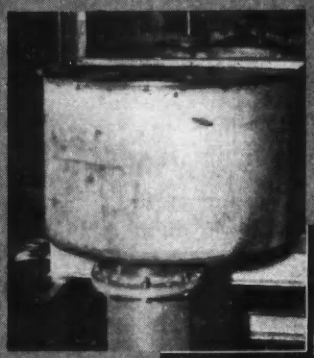

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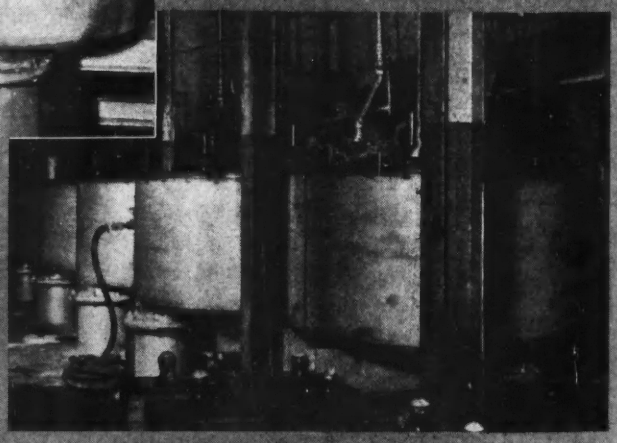

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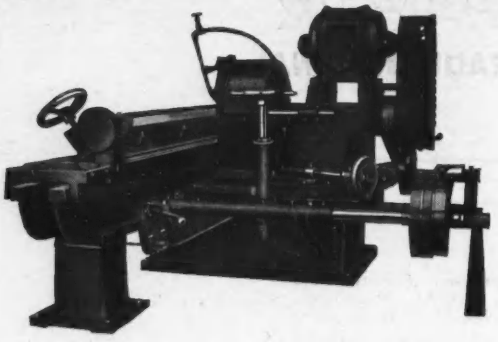

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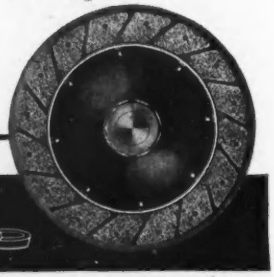

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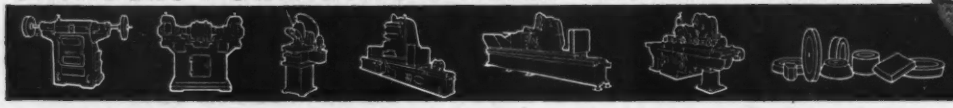

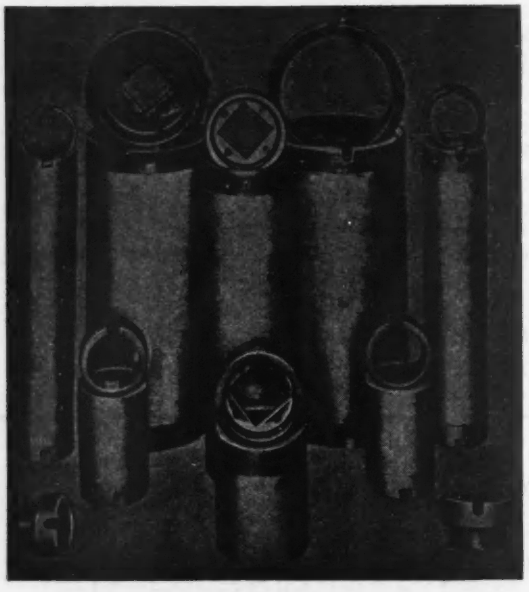

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Vol. 118, No. 26

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

June 29, 1944

Marathon To Inaugurate New Financial Plan

Special Meeting of Stockholders of Marathon Paper Mills Co. Called For July 6 To Vote On New Program—John Strange Mill Resumes Operations — Waste Paper Inventories Are Very Low.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 26, 1944—The Marathon Paper Mills Company has called a special meeting of stockholders to be held at the company's offices at Rothschild, Wis., on July 6 for the purpose of amending its articles of incorporation and adopting a comprehensive financial program, D. C. Everest, president and general manager, announced June 17.

The financing provides for authorization to borrow not exceeding $10,000,000 at a rate of interest of not more than 3¾% per annum, to be evidenced by the company's debentures maturing not later than December 31, 1960, and the authorization of 50,000 shares of cumulative preferred stock of a par value of $100 per share, with a dividend rate not to exceed 5% per annum.

Lee Higginson Corporation of Chicago is the principal underwriter for the preferred stock, the proceeds of which, together with the sale of debentures to be placed privately, will provide funds for the erection of a bleached sulphate pulp mill and the necessary dock and housing facilities at Peninsula, Ontario, Canada (to be known as Everest); the improvement and expansion of conversion facilities in the United States, and the retirement of the company's present $2,762,000 mortgage debt and redemption at par on July 1, 1944, of 11,987 outstanding shares of 6% preferred stock.

The balance of the proceeds will be used to augment working capital and enable the company to meet additional requirements of an increasing volume of business.

The company proposes to issue two shares of common stock of $12.50 par value per share in exchange for each share of the present common stock of $25 par value. This would result in the issuance of $400,000 shares of common to replace the present 200,000 shares. It is believed that advantages will accrue to the company and its stockholders through the more widespread distribution of its common stock.

Because of the fundamental changes which have taken place in recent years in the character of the company's business through the addition of new and expanding production lines for "food packaging" and the development of the chemical division, it is felt that the present corporate name is no longer descriptive of the essential nature of the business now being conducted by the company. A change in the name to "Marathon Corporation" has been recommended by the board of directors.

John Strange Co. Resumes Operations

The John Strange Paper Company, Menasha, Wis., has resumed full operations, in spite of the disastrous fire, June 13, which destroyed the 4-story office and warehouse, which also housed beater machines.

Company officials said last week that about 30 days would be required before all debris could be hauled away and building operations started.

All company records were saved, although some were found to be water damaged. The company is meeting its production requirements for war contracts.

Claims Loss of Fish in Nepco Lake

Chemical applications to kill algae in the water of Nepco lake, south of Wisconsin Rapids, Wis., used by the Nekoosa-Edwards Paper Company, Port Edwards and Nekoosa, Wis., have resulted in the loss of considerable fish, according to Theodore F. Wisniewski, assistant state sanitary engineer, in his reports to Madison, Wis.

Mr. Wisniewski made an investigation on the basis of earlier reports from Vince Skilling, state conservation warden at Wisconsin Rapids, Wis., who also reported that recent lowering of lake levels in another effort to rid the lake of algae resulted in wholesale fish deaths. The latter finding was denied by Dr. T. A. Pascoe, chief chemist of the paper company.

Dr. Pascoe also pointed out, in rebuttal of the state report that the treatment of Nepco lake with a copper sulfate solution to kill algae, as well as periodic lowering of the water to expose and burn weed beds, "has been done periodically for the last 10 years, and during those years the fishing in the lake has steadily improved."

He also maintained that the company developed the artificial lake at considerable expense to provide a source of water for paper making, and that paper needs should have priority over recreational needs.

The state sanitary engineer's office recommended that the company apply each year for permission to treat the lake, and that a representative of the sanitary engineer's office be present during the treatment.

Dr. Pascoe said the paper company is eager to cooperate with conservation and health bodies in the management of Nepco lake.

Waste Paper Inventories Decline

Inventories of waste paper have hit a new low at

(Continued on page 38)

Short Paper Supply is Big Current Problem

Midwest Market Reports Civilian Outlets Are Getting Less Paper But Hope Fourth Quarter Supply May Be Larger—To Build Paper Box Plant — Renew Waste Paper Drive — Other Market News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., June 26, 1944—With civilian outlets getting less than 65% of the paper produced and with some lines getting far less than that, the picture in the Chicago market area continues to be confused and, in certain quarters, actually gloomy. However, the process of allocating paper based on actual needs has been well and cooperatively received by local purchasers, according to reports, and there are definite hopes that by the fourth quarter of the year the overall picture will be brighter. Specifically, krafts are in perhaps the worst of all current positions, with civilian users faring far worse than the groups that are getting the sixty-five per cent. Grease proof papers are in the same category with krafts, according to local reports, while the folding box and set-up box picture grows increasingly grave. Sulphites, all grades, are far, far behind in order fulfillments and expect absolutely no improvement until the final quarter of the year. Newsprints are in a continued sharply curtailed position. Waste paper collections are fair, perhaps better here, according to reports, than in most parts of the country.

New Paper Box Plant

The American Box Board Company, one of the country's oldest and best known manufacturers of corrugated and solid fibre containers, this week completed negotiations for a new war plant to be built at once in the 51st street section of Clearing Industrial District, Inc., on Chicago's far southwest side. The entire transaction involved the acquisition of approximately 100,000 square feet of ground and a one story plant containing 58,000 square feet of floor space is to be built. Everything will be done to expedite completion of the plant for the fulfillment of war orders but the actual desire of the company is to use it as a part of its postwar expansion program. Features of the plant are a monitor-type building with cantilevered steel truss, including a depressed dock and accommodating two incoming trucks and an outgoing dock with a capacity of six trucks. There also will be an inside, depressed four-car switch track. J. S. Burns, vice president of the box company, will be in charge of the new plant. American Boxboard already has mills in Grand Rapids, Michigan, where the main offices of the company are located. The concern operates three paper mills and three box factories. The Ace Carton Corporation is also located in the 51st street section of this particular industrial area, bringing to this district of Chicago a real "collection" of container production.

Renew Waste Paper Drive

Chicago will concentrate on another gigantic overall waste paper collection drive this week end, June 24, with a goal of six million pounds. This total exceeds by 600,000 pounds the January 15 pickup which produced 5,400,000 pounds, an amount far in excess of any other American city in a similar collection. An appeal has been sent to small stores to make a special effort Saturday to pile their waste paper on the sidewalks. These stores, which do not accumulate enough wastepaper or cartons to interest dealers, are asked to have their stocks on the sidewalks shortly after the stores open. To preface the drive, volunteer groups of Scouts and other organizations will ring door bells to remind housewives to have their bundled and tied waste paper contributions on the curb on Saturday morning. In addition, 2500 Scouts will report for assignment to ward superintendents who will place scout teams on each pickup truck. Each ward will also have an army truck manned by a military driver for emergency pickups.

During the week seventy-five winning pupils from Chicago's elementary schools were guests at a party as a reward for their waste paper collection achievements. Hosts were the Associated Box Makers of America and members of this Association and the Folding Box Association were present. Edward Murphy, president of the Associated Box Makers presented American flags to the nine high scrap drive collection winners.

The plea of the current drive is one made by J. R. Robinson, Chicago Newspaper Publishers Association, who points out that "your ten pounds of paper on the sidewalk Saturday morning and rushed to the mills may be the very ten pounds to save the lives of 40 American fighting men". He added that "ten pounds of paper makes 20 containers for blood plasma with each container holding two units of plasma—so critically needed in the battle areas.

Vice-President of S.A.P.I. Reports

Vice president "Pat" Patterson, major domo of the western division of the Salesmens Association of the Paper Industry, makes a four cornered report this week.

First of all, there is to be no regular Monday noon meeting on July 3 because of the long holiday. Second, there are to be featured speakers at the noon meetings of both June 26 and July 10. The former brings A. G. Zimmerman, agent of the United States Secret Service, who will discuss "counterfeiting" for the edification of the salesmen and their guests. Mr. Zimmerman will also have a moving picture film entitled "Know Your Money". On July 10 Eugene Phillips, a local celebrity who has a wide first hand knowledge of conditions inside occupied Europe, is to be the speaker.

On August 18 the SAPEYES will converge on the exclusive Knollwood Country Club course for the second and final of the two outings to be held this year, the former having been held at the Park Ridge Country Club on June 16 with an attendance of sixty members and guests.

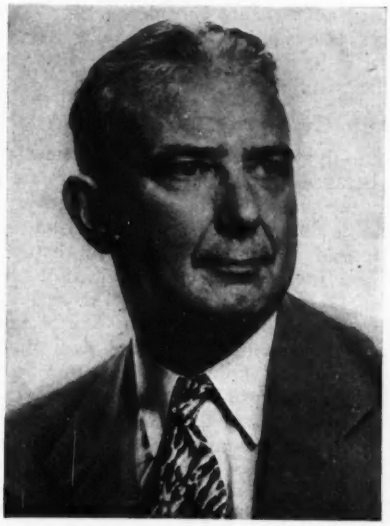
Snelling Goes to Wilson Jones

Walter L. Snelling, head of the purchasing division of Horders, Incorporated, for many years, has recently joined the Wilson Jones Company as vice-president and merchandise manager.

C. E. Mueller Joins Bulkley, Dunton

The appointment of Charles E. Mueller as sales representative of the Bulkley, Dunton Pulp Company has been announced by Fred. Enders, president. After July 1, Mr. Mueller will have his headquarters in Bulkley, Dunton's main office at 295 Madison avenue, New York. He will travel in the New England territory.

Before joining Bulkley, Dunton, Charles (Bud) Mueller was for 20 years with the Papermakers Chemical Department of the Hercules Powder Company. In 1924 he became chief chemist of the Papermakers Chemical Corporation, of Kalamazoo, Mich., which in 1932 merged with the Hercules Powder



CHARLES E. MUELLER

Company. Advancing to the position of service engineer, he later was put in charge of the casein department, and in recent years had a managerial position.

Previously he had been associated as chief chemist with the Kalamazoo Vegetable Parchment Company of Kalamazoo, Mich.

Born in Dayton, Ohio in 1899, he obtained his degree as Chemical Engineer at the University of Michigan, where he studied papermaking under Ralph Hayward, now president of KVP. He also attended Miami University at Oxford, Ohio and obtained there his B. A. degree.

Bud Mueller is well-known in the paper and pulp trade from coast to coast. His thorough technical training, coupled with a pleasing personality and an eagerness to share his knowledge with others have won him a great number of friends in the industry.

His wife, Vivian Nolan, whom he married in 1937, comes from a well-known family of papermakers. The Muellers have a 5 year old son.

May Pulpwood Receipts Higher

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 28, 1944—Total United States receipts of pulpwood in May, including imports, approximated 1,284,000 cords and showed an improvement of 27% over the same month a year ago, although pulpwood production was relatively low at that time, the War Production Board said today. However, receipts were 7% less than those in May, 1942, WPB pointed out.

Mill receipts of domestic pulpwood in May were 31% higher than they were in 1943, and approximated 1,216,000 cords. However, they were less than actual domestic needs during the period, it was reported. Receipts of pulpwood from Canada were given as approximately 68,000 cords in May.

Paper mill operations were sustained at a rate far in excess of that justified by raw material input in 1942 and 1943, WPB said. During that period wood pulp inventories dropped an estimated 600,000 tons, and pulpwood inventories fell off almost a million cords, which is equivalent to approximately 600,000 tons of wood pulp. At the same time, waste paper inventories dropped more than 300,000 tons. Consequently it was explained, during this period, when more than 1,500,000 tons of all paper making material supplies were lost, paper was being consumed from wholesalers' shelves and from converters' inventories at a rate far in excess of paper and paperboard production. Since then, military demands for paper and paperboard to support the invasion have mounted tremendously. Such items as V-boxes, waterproof wrapping, invasion maps, etc., are taking tremendous quantities of fibre so that the amount available for civilian use is continually being reduced, WPB said.

In order to meet the increased demands put upon the paper and paper board industry, still further improvement in pulpwood receipts must be obtained. James L. Madden, deputy director of WPB's Paper Division, reviewing the situation, made the following statement:

"Although receipts of pulpwood in May were higher than a year ago, it must be remembered that receipts during May 1943 were abnormally low. In addition, in the Northeast, it must be taken into account that, because of depleted mill inventories, there has been an accelerated movement of rough wood from the forests to the mills without a corresponding increase in current pulpwood production in the woods.

"In the Northeast, where the pulpwood supply picture continues to be gravely critical, domestic receipts were approximately 11,000 cords higher than they were in April, and it is expected that mill receipts will continue to show the usual seasonal increase during June and July as indicated by the three year averge of the historical period 1941-1942-1943.

Hercules Resins Now Available

With the removal of Vinsol resin and Truline binder from allocation by the War Production Board, these materials are now available to industry for all uses, the Hercules Powder Company has announced.

During the period of WPB allocation, Vinsol resin was used in asphalt emulsions for the construction of Army airports and roads in this country and overseas, and also in the manufacturing of plastics and paperboard, to replace the use of strategic metals.

Prior to being placed on allocation October 9, 1943, Vinsol resin was used in the manufacture of paper board, plastics, etc.

Truline binder finds wide use in cores and molds by foundries producing castings of all metals. With Truline freely available now, it can be more widely used by foundries to extend their supply of less available materials, such as cereal binders and linseed oil.

Canada to Renew Fight on Spruce Bud Worm

Lands and Forest Department Began Using New Insecticide "DDT" On Pest By Spraying From Auto-Gyro Plane—15,000 Square Miles Damaged—Start Work On New Brompton Sulphate Pulp Mill.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., June 26, 1944—A more intensive campaign, with new and better weapons, is under way in Canada against the greatest enemy of forest lands —the destructive spruce bud worm. In Ontario the Department of Lands and Forests in May started using an auto-gyro plane to spray the forests with the new and already famous insecticide dichloro-diphenyl-trichloro ethane, more commonly known as DDT, while federal officials are completing plans to transplant millions of the insect parasite known as phytodictus fumiferanae from British Columbia on the theory that a civil war in the forestry bug world may go a long way towards eliminating or controlling the spruce bud worm.

Forest entomologists have for some years been warning that unless the pest is checked soon, most of the pulpwood stands in Canada are in danger of being seriously damaged. Not only has the spruce bud worm already destroyed an estimated 15,000 square miles of timber lands in northern Ontario, but the destruction wrought has been largely responsible for the recent forest fires which are estimated to have destroyed 170,000 acres of standing timber.

The rapid spread of recent forest fires and the difficulty with which they were checked, is attributed to a material degree to the effect of the spruce bud worm, by Dominion entomologists. Dead balsam and white spruce are like tinder in the forest and it is almost impossible to check the terrific blaze that results once a bush fire gets under way in these areas.

Paper Men Ask For Assistance

Recently a committee from the Canadian Pulp and Paper Association, headed by Earl Shaw, Montreal, approached the National Research Council at Ottawa and asked for guidance and assistance in a Dominion-wide campaign against the pest. As a result, the National Research Council is studying all the work now being done and is considering adding its resources to the fight to save the forests from the ravages of the insect.

The bud worms hatch on the leaves of balsam and spruce about the middle of the summer and without previous feeding weave a small tent-like shelter in which they live without feeding for the rest of the summer. In the following spring they come out and devote themselves to their career of destruction, eating and growing, usually feeding on the new foliage, for about two months. About the end of June the worms are transformed into pupae and about ten days later they emerge as pretty nocturnal moths with an amazing fecundity. They lay the eggs on needles of balsam and spruce in the area. The spruce bud worms spread more rapidly through forests in which there is a proportion of balsam, but it readily attacks white and red spruce.

To date the greatest damage has been done in Ontario and Quebec, where, it has been estimated the pest has destroyed, during the last 40 years, 250 million cords of pulpwood up to the current year.

The Province of Manitoba officials are keenly aware of the dangers of the spread Westward of the bud worm and are keeping a sharp watch for it on their eastern boundary. The pest has already appeared as far West as Sioux Lookout. Senior Forest Engineer, C. G. Gill, of Manitoba Forest Service, believes that because the bud worm prefers balsam rather than spruce, good forest management may help control the pest. Paper companies are being asked to cut a higher proportion of balsam for pulp and a reduction of dues on balsam is being considered.

The pest leaves a wide swath of dead trees through the forest it has attacked and these dead trees constitute the greatest fire hazard.

Auto-Gyro Chosen For New Attack

The auto-gyro was chosen for the new attack on the pest because it was found superior to an ordinary plane for the purpose. The gyro can travel at lower levels and at slower speed. Spraying from planes has been practised in Ontario for more than 15 years. Usually the insecticide was an arsenate. The new insecticide, DDT, which has proven so amazingly useful in the army for de-lousing in North Africa and Italy, is being provided in limited quantities by the United States Government for the experiment here. It has already achieved marvelous results spraying from aeroplanes in northern Alberta to free large areas along the Alaska highway from mosquitoes. DDT is harmless to wild life in the areas sprayed, neither birds, animals nor fish being affected by it. How effective it will be when sprayed on large areas of forest has yet to be determined. Only small quantities are yet available.

Studies by entomologists have shown that in areas in British Columbia where the insect parasite, phytodictus fumiferanae, is found plentiful, the forest stands appear to be more or less resistant to the bud worm. So far there is no definite information on the ability of this parasite to actually control the bud worm in eastern forests, but it is known to prey on the larvae of this insect in British Columbia forests. Dr. C. E. Atwood, Division of Entomology, Ottawa, says, "They are found in sufficient quantities in British Columbia to be suspected of having value in prevention of outbreaks of the bud worm there."

Further protective measures may develop from experiments being conducted in the Dominion Entomological Laboratory.

Work Starts on New Brompton Mill

Construction of the new sulphate pulp mill of Brompton Pulp and Paper Company at Red Rock, on the north shore of Lake Superior, has begun, it is understood. Contingent on equipment and materials being received on schedule and an adequate supply of labor being maintained, it is anticipated that the mill will be completed and in operation by the fall of next year. The current progress has only been achieved after overcoming a number of difficulties, chief of which, it is stated, were priorities, for these were dependent not only on the authorization of the Canadian, but United States government authorities.

Awards for Government Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 28, 1944—D. L. Ward Company has been awarded the contract for furnishing the Government Printing Office with 17,160 pounds of green C. W. paper at 8.95 cents. Other paper awards announced for paper bought on the open market include the following.

R. P. Andrews Paper Company will furnish 5,600 pounds of gray bristol at 11.55 cents and 36,000 pounds will be furnished by the Graham Paper Company, at 11.65 cents. Barton, Duer & Koch Paper Company will furnish 100,000 pounds of white index paper at 15.16 cents and the same company will furnish the same amount at the same price. The same company will also furnish 140,000 pounds of the same at 15.16 cents and the Champion Paper and Fibre Company will furnish 40,533 pounds of white book paper at 10.21 cents.

Barton, Duer & Koch Paper Company will furnish 140,000 pounds of rag index paper at 15.64 cents and the same company will also furnish 100,000 pounds of white index paper at 15.64 cents. The same company will also furnish 100,000 pounds of same at the same price and Bermingham & Prosser Company will furnish 100,000 pounds of 25% rag, white ledger paper at 14.45 cents and the same company will furnish the same amount of the same paper at the same price. Walker Goulard Plehn Company will furnish two lots of 50,000 pounds each of white ledger papers at 14.44 cents. The Stanford Paper Company will furnish 16,425 pounds of emulsified paper at 11.88 cents.

The Stanford Paper Company will furnish two lots of 50,000 pounds each of yellow C. W. paper at 8.08 cents. Barton, Duer & Koch Paper Company will furnish 40,960 pounds of book paper at 7.04 cents.

D. L. Ward Company will furnish 56,160 pounds of white ditto paper at 8.63 cents and Zellerbach Paper Company will furnish 120,000 pounds of white C. W. paper at 8.63 cents. Barton, Duer & Koch Paper Company will furnish 20,150 pounds of white cover paper at .12 cents and the same firm will furnish 50,000 sheets of red pressboard at $77.50 per M sheets and also 100,000 sheets of gray pressboard at $188,50 per M sheets. R. P. Andrews Paper Company will furnish 20,000 pounds of white tag paper at 9.75 cents and Bermingham & Prosser Company will furnish 67,200 pounds of white ledger paper at 14.45 cents.

Graham Paper Company will furnish 36,000 pounds of white Mfd. paper at 10.7 cents, and 70,000 pounds of white index paper will be furnished by the Barton, Duer & Koch Paper Company at 14.72 cents. The same firm will also furnish 44,000 pounds of white index paper at 14.72 cents. Perkins-Goodwin Company will furnish 250,000 pounds of M. F. book pages at 7.35 cents and D. L. Ward Company will furnish 56,100 pounds of Hammermill duplicator paper at 8.63 cents. Butler Company will furnish 50,000 pounds of white Ditto paper at 8.32 cents, and Crocker, Burbbank Company will furnish 7,680 pounds of chart paper at $41.50 per cwt.

Eastern Corporation will furnish 60,000 pounds of white ledger paper at 9.6 cents and Mead Sales Company will furnish 24,800 pounds of book paper at 9 cents and Central Ohio Paper Company will furnish 62,000 pounds of buff offset book paper at 9.09 cents.

Ditto, Inc., will furnish 20,500 pounds of white ditto paper at 15.65 cents and Franklin Research Company will furnish 289,000 pounds of chart paper at 19.425 cents and the same company will furnish 242,500 pounds of same at the same price. Dill & Collins, Company will furnish 80,700 pounds of coated book paper at 9.9 cents.

Zellerbach Company will furnish 250,000 pounds of white writing paper at 8.63 cents and the same firm will furnish the same amount of the same at the same price. The same firm will also furnish 130,000 pounds of same at the same price and also 160,000 pounds of same yellow will be furnished at the same price by the same firm. The same firm will also furnish 5,479 pounds of white ditto paper at 16 cents and also 2,121 pounds of the same at the same price.

Barton Duer & Koch Paper Company will furnish 20,088 pounds of white cover paper at 12 cents and the Marquette Paper Company will furnish 64,750 pounds of pink writing paper at $5,238.28.

Ohio TAPPI Meets

The Ohio Section of the Technical Association of the Pulp and Paper Industry held a dinner meeting at the Manchester Hotel, Middletown, Ohio, on Saturday evening, June 17. About fifty attended.

The evening was devoted to a discussion of the use of old paper stock in the fine paper mill, which discussion was led very ably by H. H. Latimer of the Champion Paper and Fibre Company. S. E. Olson of Champion read his paper which had been prepared in collaboration with Dr. Hoffman and read at the national meeting of the Superintendents Association at Chicago. E. E. Grant preceded all speakers with a short talk on the work of the Pulp Allocations Committee in Washington, of which he is a member. The meeting was a very interesting one throughout, there was much discussion from the floor and some quite interesting points brought to light.

Among those present were T. Agronin, J. J. Andrews, J. R. Arthur, M. L. Barker, B. M. Baxter, C. E. Brandon, H. A. Brawn, Duncan Brown, John Burdsal, C. H. Butterfield, C. R. Faulkender, Harry C. Fisher, Lawrence J. Gaede, W. W. Galloway, Arthur F. Gardner, Leo Geiser, E. E. Grant, Harry Hadley, H. H. Harrison, L. Hawarth, A. W. Henrick, J. A. Hoerner, Albert Kind, Arthur Kjellstrand, H. H. Latimer, Edward Lum, J. Martindale, Kon Matchuk, F. A. McGee, Leo J. Meyer, Clyde Norcross, Tom O'Flynn, S. E. Olson, W. A. Olwer, Paul Petzhold, C. W. Richards, Douglas Robbins, Carl Roess, J. W. Schuster, R. H. G. Smith, G. H. Suhs, P. G. Swayne, Art Thurn, John Troxell, H. Waffenschmidt, Matt Watkins, A. W. Westendorff, M. E. Woodruff and Roy Zellers.

Instrumentation Studies. XLVII*

The Measurement of the Stretch of Paper

By The Staff of The Institute of Paper Chemistry

Abstract

The significance of stretch and the load-elongation curve are discussed briefly. The measurement of stretch by means of the Amthor universal tensile strength tester, the Clark stretch tester, the Schopper electrically driven strength tester, and the Scott Serigraph is examined in some detail. The principle of the Scott Serigraph is satisfactory. The particular model used in this study was of rather low sensitivity. The stretch indicating mechanism of the Schopper instrument is dynamically unbalanced to such a degree that the indicator jumps to higher readings when the instrument is jarred by the failure of the specimen. This fault was temporarily minimized by counterbalancing. The Amthor and the counterbalanced Schopper instruments agree fairly well but indicate stretches which are seriously high, as compared with values obtained with the Scott instrument. The reason for the discrepancy rests in the fact that both Amthor and Schopper instruments are so designed as to include in the indicated stretch or elongation reading some of the elongation which occurs after start of the specimen failure. Stretch values obtained with the Clark instrument tend to be less than those obtained with the Amthor or Schopper instruments. The elongations measured with this instrument also include part of the failure elongation mentioned above, although a smaller part than those measured with the Amthor and Schopper testers. The Clark tester was not compared with the Scott instrument. Corroborating published results of other workers, it was found that stretch decreases as the length of the specimen increases. Contrary to suggestions in the literature, tests with two papers showed no change in stretch with change in rate of loading, and showed that stretch tends to increase with increase in specimen width.

In the paper industry, stretch is defined as the percentage elongation produced by a tensile force up to the instant of rupture *(1)*. This property of paper has not been as generally useful as tensile strength for two reasons. First, it has not proved to be as satisfactory an index of stock treatment and, second, it is a difficult quantity to measure both accurately and conveniently. There is reason to believe that more frequent application of the property of stretch might be made. Stretch is important wherever a web is handled under tension. For instance, if the tension becomes greater on one edge of the web than on the other, a tear may start unless the sheet can yield enough to distribute the stress more uniformly. A web with very low stretch will break frequently from such a cause regardless of its tensile strength. Stretch is closely related to initial tearing strength *(1)*; a high stretch is associated with high initial tearing strength. Cellophane is a particularly good illustration of this fact in that it has a high stretch and high initial tear, although the tearing strength is low after a tear is started. On the other hand, glassine paper has a lower stretch and lower initial tear. A satisfactory stretch is necessary for a sheet to fold well in packaging and wrapping, and it is important in twisting papers, cable papers, toweling, and tissues. Stretch is important in bursting strength; a sheet of high stretch has greater bursting strength than a sheet of the same tensile strength but possessing a lower stretch. Likewise, stretch enters into the property of folding endurance.

* This report is one of a series issued as a part of the instrumentation program of the American Paper and Pulp Association.

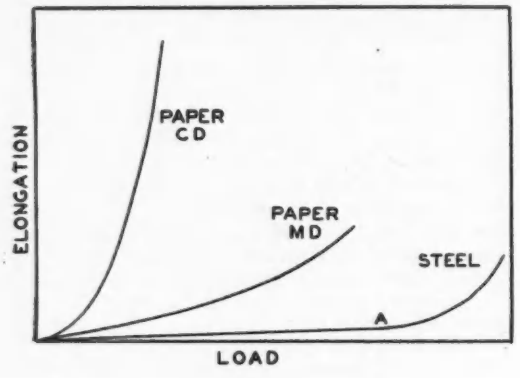


FIG. 1
Schematic Load-Elongation Curve

The Load-Deformation Relationship

Stretch is a limiting value—i. e., it is the maximum percentage elongation. It is perhaps unfortunate that more attention has not been paid to the relationship between load and percentage elongation for loads less than those which rupture the specimen. Some of the other properties of paper would be better understood if this relationship were more frequently considered. Engineers, in their study and use of structural materials, and the textile industry have relied on load-deformation curves for many years; the paper industry may be "missing a bet" by not doing the same.

Some typical load-deformation curves are shown in Fig. 1. In the curve for steel, a linear relationship is found to hold from the origin to the point *A*. In this region the deformation is accurately proportional to the load, and Hooke's law holds. Above point *A*, the deformation increases at a greater rate. The end of the curve indicates the point of rupture or failure. For papers there is at no time a linear relationship between load and elongation. The elongation increases more and more rapidly as the load is increased. The slope of the curve and its rate of change are less for the machine direction of paper than for the cross-machine direction. The end of the curve again indicates failure of the specimen; the load corresponding to that point is the tensile strength of the specimen, and the percentage elongation corresponding to that point is the stretch.

Most tensile testers may be equipped with a recording mechanism which automatically draws the load-elongation curve during the test. If a recording attachment is not available, the data for plotting the curves may be obtained with any tester having both load and

elongation scales. Two observers must cooperate in making a measurement; one watches the load scale and the other the elongation scale.

Types of Stretch Testers

The stretch measuring instruments most commonly used in the paper industry are combined tensile and stretch testers. It appears that the Clark stretch tester is the only instrument which does not include a mechanism for measuring the load applied to the specimen. The several types of elongation or stretch measuring devices of application to the paper industry are discussed briefly below. Detailed descriptions are given of the particular instruments which were available for actual study and testing.

Because of the differences in mechanism it is convenient to divide the instruments into two groups—viz., those which indicate the stretch or elongation at failure, and those which automatically trace the load-elongation curve. Likewise, it is convenient to subdivide these two groups further on the basis of the loading mechanism employed—viz., the indicating instruments, which include pendulum, hydraulic, and spring types, and the recording instruments, which include pendulum and inclined-plane types. The loading mechanisms of all these types were described at least briefly in Report 29, Part I *(2)*. The Clark stretch tester is also an indicating instrument. Two of the pendulum-type indicating instruments (an Amthor and a Schopper), one of the pendulum-type recording instruments (a Scott), and the Clark stretch tester were studied in detail.

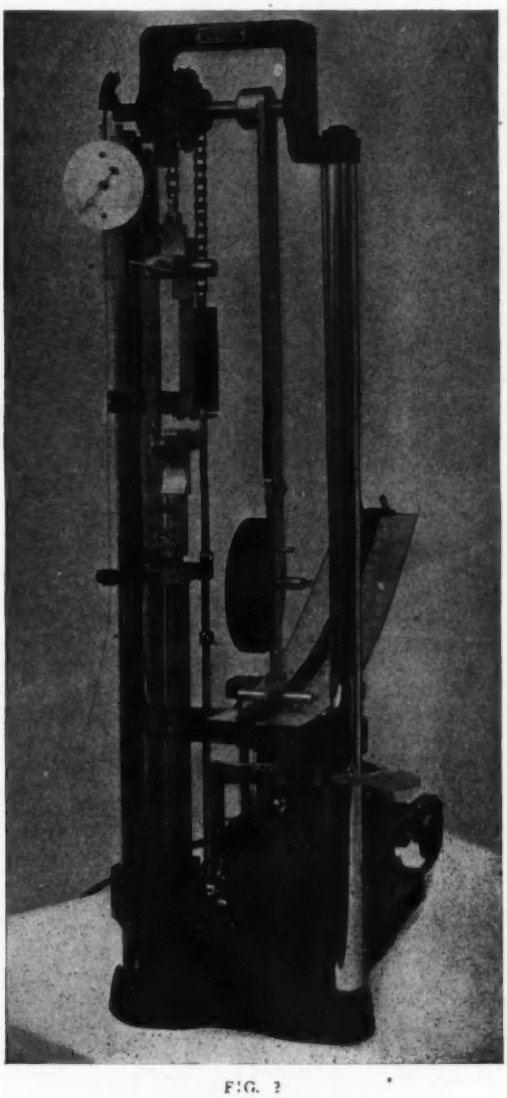


FIG. 2
Amthor Tensile Tester

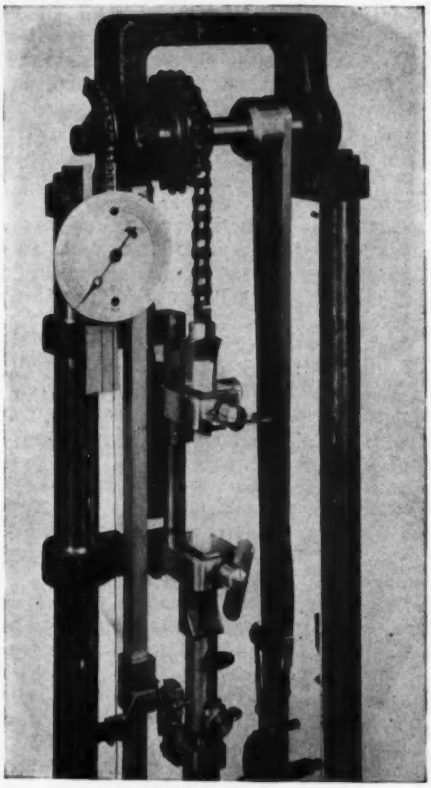


FIG. 3
Stretch Mechanism of Amthor Tester

Amthor Universal Tensile Strength Tester

The Amthor universal tensile strength tester *(3, 4)* is shown in Fig. 2. The stretch indicating mechanism is shown on a large scale in Fig. 3. The circular scale, seen in the upper left-hand part of the photograph, is suspended by a chain from a quadrant fastened to the pendulum axle and moves vertically along a track. The effective radius of this quadrant is the same as that of the sprocket which supports the upper specimen clamp. Hence, the scale and the upper clamp move up and down together during the operation of the instrument and, furthermore, they move through identical distances. A cord is connected to the indicating pointer through a gear train, and runs down to a spring clip attached to the slider on the square rod which appears just to the left of the specimen clamps. A projection on this slider engages a toggle link fastened to the lower clamp. The slider and toggle are shown disengaged in Fig. 4. Thus, when the toggle is engaged with the slider, relative motion of the two clamps is indicated by the pointer on the scale. If the two clamps move at the same speed—i. e., if the speci-

men is inextensible—the scale and the slider move with the same speed and the pointer remains at its initial position. If the specimen elongates, the lower clamp moves down faster than the upper clamp, the slider moves down faster than the scale, and the pointer indicates the change in separation of the slider and scale and, therefore, the change in separation of the two clamps. The gear train which drives the pointer amplifies the actual change in separation, so that the scale is sufficiently extended to be easily readable. In order that the pointer may stop at an indication of the stretch of the specimen, there must be a means of disengaging the toggle from the slider at the instant the specimen breaks so that, as the lower clamp continues to move down, the slider may remain at the position it had when the specimen broke. Pawls on the pendulum engage teeth on the tensile scale quadrant and hold the pendulum and, therefore, the stretch scale in position when the specimen breaks. The rapid disengagement of the toggle from the slider is taken care of in the following way: The lower clamp has a small amount of vertical play on the rod to which it is fastened. It may be locked in position by the thumb screw shown in the lower right-hand part of Fig. 4. When the clamp is lifted and fastened, the pin projecting from the left side of the clamp moves the intermediate link so as to force the toggle into position to engage the slider. The specimen is clamped with the mechanism in that position. As soon as operation of the instrument is begun and the tension of the specimen is greater than the weight of the clamp, the thumb screw is loosened. When the specimen breaks, the clamp drops and the intermediate link is moved back so that the spring-actuated toggle can disengage the slider.

The complete sequence of operations in a stretch test is as follows: The lower clamp is lifted and fastened with the thumb screw and the separation of the clamps is adjusted to the desired value. The specimen is secured in the upper clamp so as to hang between the jaws of the lower clamp and is then put under slight tension to remove any general waviness in the specimen and is fastened in the lower clamp. The tentative TAPPI method for stretch *(5)* suggests values for this tension which are required to remove waviness. The slider is pulled up until it is against the toggle. The cord is slipped through the spring clip until the pointer is over the zero mark of the scale. The instrument is set in operation. When the specimen breaks, the driving mechanism is reversed and the scale reading is noted. If the specimen length used is that for which the percentage stretch scale is divided, the reading is taken from that scale. If the specimen length is other than that, the reading is taken from the elongation scale and the percentage stretch is calculated by dividing the elongation by the length of the specimen and multiplying by 100%.

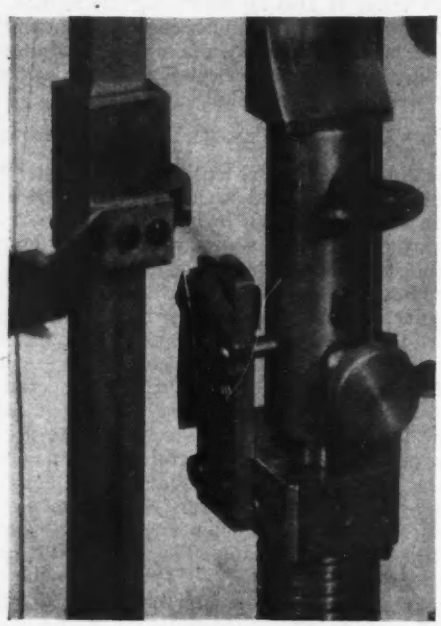


FIG. 4
Details of Amthor Stretch Mechanism

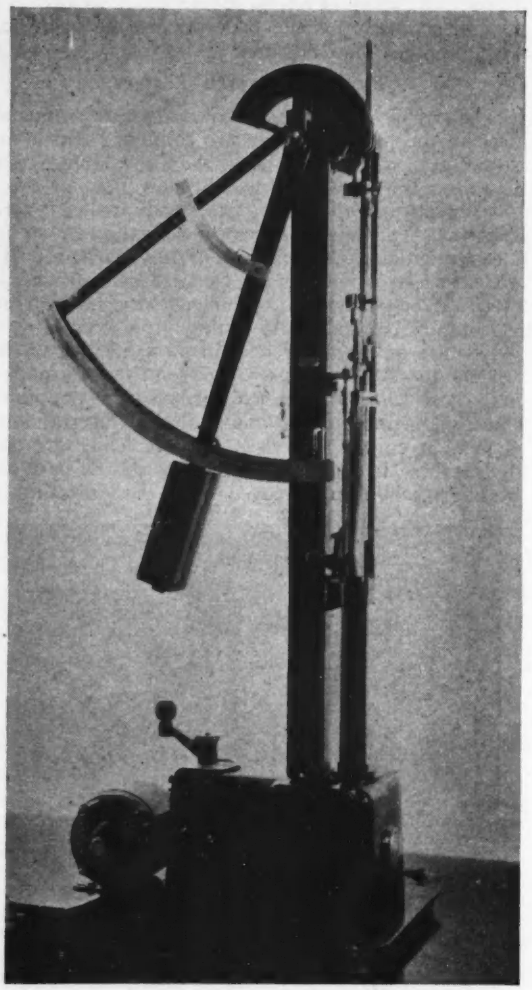


FIG. 5
Schopper Strength Tester

The lower clamp speed of this instrument is 12 inches per minute. This yields average rates of loading of 2.5 pounds per second on the 15-pound tensile scale, 7.5 pounds per second on the 50-pound scale, and 27 pounds per second on the 200-pound scale. The jaws are 1 inch wide.

Schopper Strength Tester

The Schopper electrically driven strength tester

(6, 7) is shown in Fig. 5, and the stretch indicating mechanism is emphasized in Fig. 6. The elongation and stretch scales are marked on a quadrant arm fastened to the pendulum. The pointer is rigidly connected to a segment of a gear which rotates about the same axis as does the pendulum. This gear engages a vertical rack which is connected by a rod to a slider shown in the lower right-hand corner of Fig. 6. The lower specimen clamp needs no further description. The toggle attached to this clamp engages a projection on the slider. The scale, being fastened to the pendulum, moves through exactly the same linear distance as does the upper specimen clamp and through the same angle as the pendulum. The pointer, being connected to the lower clamp, moves through an angle proportional to the linear distance traveled by the lower clamp. For inextensible specimens, there is no displacement of the pointer along the scale, because equal displacements of the clamps produce equal angular displacements of pendulum and pointer.

The lower clamp speed is continuously variable between 2 and 20 inches per minute. This yields rates of loading varying from 0.12 to 1.2 pounds per second for the 15-pound tensile scale and 0.6 to 6 pounds per second for the 75-pound scale. The jaws are 15 mm. wide.

Scott Serigraph

It was previously pointed out that most pendulum-type testers may be equipped with a recording mechanism for automatically tracing the load-elongation curve for the specimen. The only instrument so equipped which was studied in this investigation was the Scott Serigraph, Model J3 *(8, 9)*. It is shown in

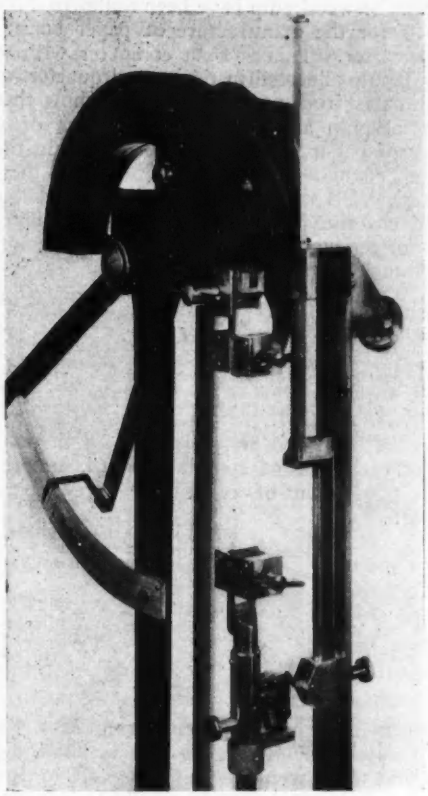


FIG. 6
Stretch Mechanism of Schopper Tester

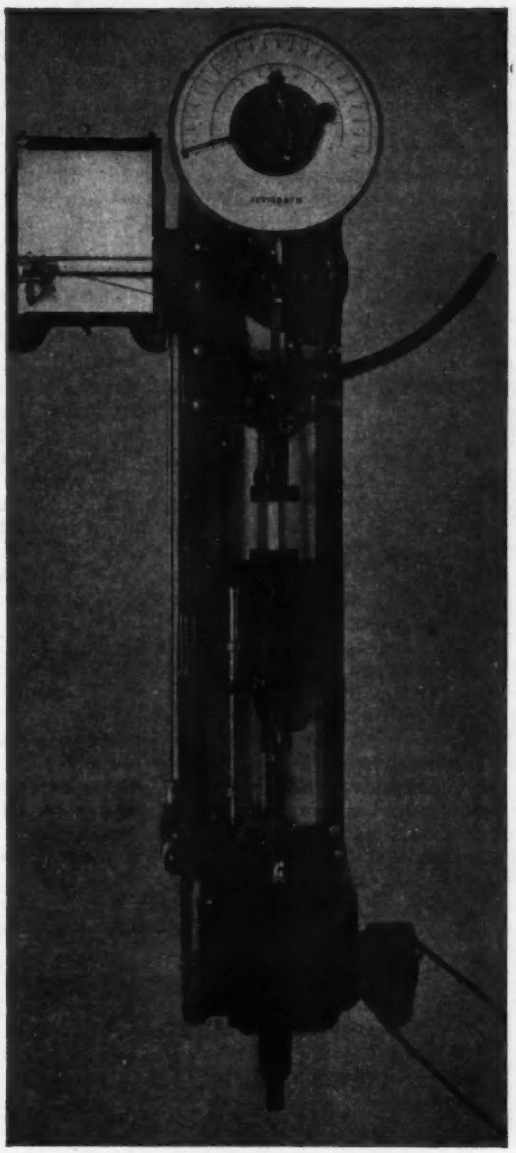


FIG. 7
Scott Serigraph, Model J 3

Fig. 7. The chart table moves vertically and is geared to the driving mechanism for the lower clamp, so that movement of the table is proportional to the movement of the lower clamp. The pen and its carriage move across the chart on a horizontal track. The carriage is coupled by a rod to the pendulum. Thus, the horizontal position of the pen bears a definite relationship to the position of the pendulum and, hence, to the load on the specimen. The position of the pendulum is, of course, determined by the position of the upper specimen clamp. Because the chart table moves downward with a speed proportional to the speed of the lower clamp, the pen does not trace a horizontal line when an inextensible specimen is used. The trace for such specimen is a nearly straight line sloping up from left to right. The trace is actually slightly concave upward due to the fact that the displacement of the pendulum is not proportional to the displacement of the upper clamp *(2)*. Hence, the chart does not

have rectangular coördinates. The lines of constant load are vertical, but the lines of constant elongation are the slightly curved slanting lines. When an extensible specimen is used, the upper clamp does not move as rapidly as the lower clamp, the pendulum lags with respect to the motion it would have for an inextensible specimen, and the trace is therefore a curve, concave upward, with a curvature more pronounced than that of the lines of constant elongation. The chart and typical curves obtained with the instrument are illustrated in Fig. 8. The curves have been separated by a relative shift along the elongation axis.

The operation of the instrument is as follows: The pendulum is swung to its zero position, the clamp separation is adjusted to the desired value, and the specimen is clamped. The chart is fastened to the table and aligned so that the pen rests on the zero of both load and elongation scales. The vertical alignment of the chart is checked by running the table up and down by hand to see that the pen accurately follows the vertical axis of the chart. The instrument is put into operation, and upon completion of the test the pen is lifted and the pendulum and lower clamp brought back to their zero positions.

The jaws are 3 inches wide and the lower clamp speed is continuously variable between 3 and 20 inches per minute.

Other instruments use recorders differing in details from this one, but the general principles are the same —e. g., the chart paper may be wrapped around a drum, the rotation of which is controlled by the lower clamp, instead of being fastened to a linearly moving table as in the case of the Scott Serigraph.

Inclined plane tensile testers *(2)* have recording mechanisms. The simplest form of such a recorder consists of a stationary chart and a pen attached to the carriage. With an inextensible specimen the carriage does not move during the rotation of the plane and, therefore, the lines of constant elongation are circular arcs with their common centers of curvature

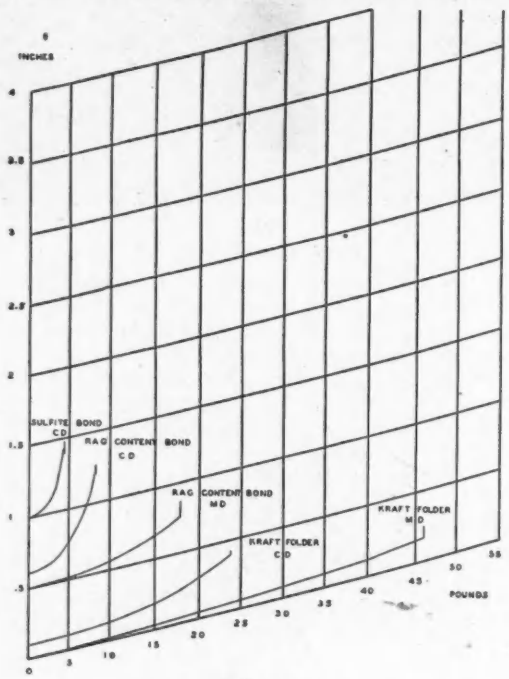


FIG. 8
Load-Elongation Curves Obtained with Scott Serigraph

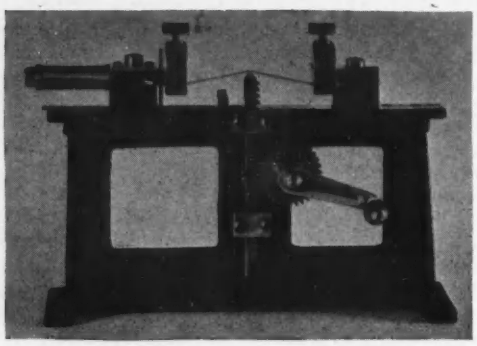


FIG. 9
Clark Stretch Tester

at the axis of the rotating system. If the specimen elongates at constant load, the carriage moves along the track and the pen traces a straight line. Hence, the lines of constant load are straight radial lines. This arrangement is seldom, if ever, used for testing paper, as the sensitivity of the elongation measurement is not adequate unless unusually long specimens are employed. It is commonly used in the textile industry.

(To Be Continued)

Less Pulp For Board in Next Quarter

WASHINGTON, D. C., June 28, 1944—Members of the Container Board and Fiber Box Industry Advisory Committee, meeting with the War Production Board in Washington this week, were told that 980,254 tons of wood pulp have been authorized by WPB officials for the manufacture of paper board in the third quarter. This amount compares with 983,924 tons of pulp allocated in the second quarter.

Estimates from paper board mills show that from the total pulp allocated, 2,315,900 tons of various grades of paper board can be produced in the third quarter, compared with 2,307,835 tons in the second quarter, WPB said. The following report was presented covering preliminary figures on pulp allocations for the manufacture of different types of paper board, including container board:

Products	*Third Quarter*—1944	*Second Quarter*
Container Board	623,364 tons	625,032 tons
Folding Boxboard	119,177 tons	112,559 tons
Set-up Boxboard	1,076 tons	2,077 tons
Cardboard	5,912 tons	6,318 tons
Miscellaneous Board	39,856 tons	43,548 tons
Building Board	191,049 tons	194,390 tons
Total	980,254 tons	983,924 tons

Amounts of wood pulp allocated for the manufacture of each type of container board, and the estimated production of each type were reported as follows:

Container Boards	WPB Third Quarter Authorized Use Of Pulp—In Tons	Third Quarter Estimated Production Of Board By Mills—In Tons
Kraft liner	407,321 tons	388,709 tons
Jute Liner (Including V-Box and other)	55,057 tons	326,847 tons
Corrugating Board	134,793 tons	298,683 tons
Container Chip	3,504 tons	78,349 tons
Other Container Board	22,689 tons	30,452 tons
Total Container Board	623,364 tons	1,123,040 tons

Collections of waste paper during May were reported nearly as high as in March, but indications were that there would be a falling off in June and probably during the summer months unless additional workers are found to replace school children.

Obituary

Douglas E. Scott

Douglas E. Scott died at St. Luke's Hospital, Cleveland, Ohio, on June 9, after a serious illness. Mr. Scott was 53 years old. Prior to and during the last war he worked for Arthur D. Little, Inc., and from 1920 to 1923 he was a technical consultant for several concerns. In 1924 Mr. Scott went to Chagrin Falls, Ohio, to work for the Adams Bag Company which subsequently became a part of the Chase Bag Company. He was a charter member of the Technical Association of the Pulp and Paper Industry. Mr. Scott is survived by his wife, Mrs. Gertrude Hutchinson Scott and two sons, T/Sgt. Douglas E. Scott and Sgt. Robert W. Scott. J. E. Becker, plant manager of the Chase Bag Company comments: "We have lost a man who has contributed a great deal to the pulp and paper industry over the past years."

Note: The editors regret that through haste in preparing Mr. Scott's obituary which appeared on page 15 of the June 22nd issue Mr. Scott's career records were confused with those of Arthur A. Scott. The obituary reported on June 22 should therefore be disregarded.

Alexander Thomson, Jr.

Alexander Thomson, Jr., vice-president and advertising manager of the Champion Paper and Fiber Company, Hamilton, Ohio, died late Sunday at the home of his mother, Mrs. Alexander Thomson, Sr., of 841 Woodbine avenue, Glendale.

Mr. Thomson, who lived at 1025 Laurel avenue, had been in failing health for several years. He was 35.

He attended school in Asheville, N. C., for four years, and made a world tour in the late 1920s. Upon his return he entered the research department of the paper concern and later joined the advertising staff. He was associated with the Cincinnati sales office from 1931 to 1935 and was active in the Junior Chamber of Commerce here.

Mr. Thomson became vice-president of the company after the death of his father, Alexander Thomson, Sr., in 1939, who was also widely known in the industry.

He leaves his widow, Mrs. Adele Noyes Thomson, of Cincinnati; two children, Adele Louise and Alexander Thomson III; his mother, Mrs. Alexander Thomson, Sr., president of Western College, Oxford; and three brothers. His brothers are Charles Dabney Thomson, Lewis Clark Thomson and Chilton Thomson. Mr. Thomson was the grandson of Dr. Charles W. Dabney, president emeritus of the University of Cincinnati.

Mrs. W. E. Smiddy

Mrs. W. E. Smiddy, mother of William E. Smiddy, Jr., New York Office Manager of Missisquoi Corporation, died at her home in St. Albans, Vt., on Friday June 16. Her late husband was connected with the "St. Albans Messenger", one of Vermont's leading newspapers.

We're in it for the duration

SINCE 1828

Continuously We Have Served The Paper Industry.

Since War II was declared we have used all our manufacturing facilities, and done our small part to help build our fighting machine for war.

At the same time we have been planning for peacetime equipment and improvements NOW!

We have some of our machines available to produce new machinery for civilian products.

Paper Machines
Paper Bag Machines Paper Cutters
Can be built with a PDIA Priority rating.

THE SMITH & WINCHESTER
MANUFACTURING COMPANY
PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT

Pacific Technical Men and Superintendents Meet at Portland, Ore.

The annual joint meeting of the Pacific Section of TAPPI and the Pacific Coast Division of the American Pulp and Paper Mill Superintendents Association was held at the Multnomah Hotel, Portland, Ore., on June 3, 1944. Members of the two groups met separately at 10 A. M. for business sessions and election of officers.

The Pacific Section of TAPPI elected the following men for the year 1944-45: Erik Ekholm, chairman; H. W. Bialkowsky, vice chairman; R. M. True, secretary-treasurer; Zina A. Wise, executive committee. C. A. Enghouse, retiring chairman, automatically becomes a member of the executive committee for the ensuing year.

The morning joint technical meeting convened at 10:30 A. M. with Erik Ekholm, newly-elected chairman of Pacific Section, presiding. C. A. Anderson, Crown Willamette Paper Co., Division of Crown Zellerbach Corporation, Camas, Wash., presented a paper entitled "Effects of Wood Variables and Chipper Damage on Pulp Quality." In this paper Mr. Anderson outlined the work done at the Camas laboratory. An interesting discussion followed the presentation of this paper.

Walter W. R. May, publisher of Forest Products News, was guest speaker at the men's luncheon. Mr. May's subject was "Post-War Planning on the Pacific Coast" in which he contributed many valuable ideas for the post-war era.

The technical meeting reconvened at 2:00 P. M. and "Pulp and Paper Mill Slime and Its Control" was presented by Glen King, research chemist, Washington Pulp and Paper Company, Division of Crown Zellerbach Corporation, Port Angeles, Wash. Mr. King gave a factual and comprehensive report of the work on slime control at the Port Angeles mill covering a period of several years.

"Graphical Records in a Modern Industrial Plant" by A. S. Gerry, Weyerhaeuser Timber Company, Pulp Division, Everett, Wash., gave a detailed report of their system of record keeping.

The papers by Messrs. Anderson, King and Gerry were presented in competition for the Shibley Award, offered annually by Pacific Section.

H. A. Schmitz, A. O. Smith Corporation, Milwaukee, Wis., presented a paper on "The Use of Corrosion Resistant Alloy Linings in the Pulp and Paper Industry" which was well received by the 175 men present at the meeting.

The meeting concluded with a reception and banquet in the evening. At the banquet, A. G. Natwick, chairman of the Joint Meeting presented the Shibley Award to Glen King for his excellent paper on slime control.

Those In Attendance

The registration was as follows:

O. C. Abbott, Mr. and Mrs. C. E. Ackley, Mr. and Mrs. G. F. Alcorn, Mr. and Mrs. Fred Alsop, C. A. Anderson, Mr. and Mrs. Velden Anderson, F. R. Armbruster, D. B. Armstrong, Miss Baird, W. G. Ballantyne, E. R. Barrett, Vern C. Bason, John Baum, H. L. Berg, J. A. Blake, Mr. and Mrs. Carl E. Braun, Harry Bressler, Martin Breuen, M. M. Brisbois, E. Butts, A. M. Cadigan, E. L. Chadwick, E. Christoferson, Mr. and Mrs. J. W. Clark, Mr. and Mrs. W. W. Clark, George Cleary, N. W. Coster, J. V. B. Cox, G. R. Cranor, George M. Cunningham, H. N. Danielsen, H. A. Des Marais, Mr. and Mrs. John Doering, R. E. Drane, Mrs. Dudley, J. A. Dykstra, J. L. Edwards, Erik Ekholm, C. A. Enghause, E. D. Ericsson, A. E. Erickson, Ed Escher, Mr. and Mrs. Carl Fahlstrom, L. G. Fear, Mr. and Mrs. Chester A. Fee, D. G. Felthouse, Jas. Fowler, W. J. F. Francis, J. D. Fraser, Mr. and Mrs. G. H. Galloway, Mr. and Mrs. Irving Gard, Mr. and Mrs. L. G. Gardner, J. E. Garrison, Mr. and Mrs. N. O. Galteland, Mrs. Prosper Ganty, A. S. Gerry, W. R. Gibson, Mrs. Gilbert, Harry Glen, Al Graef, Mrs. Mildred Grae, C. H. Graham, T. H. Grant, Mr. and Mrs. H. A. Gunhus.

F. J. Hamilton, Mr. and Mrs. Jess Harris, Mr. and Mrs. John F. Hart, Mr. and Mrs. H. A. Hauff, Mr. and Mrs. Jan Haugerod, John Heintz, T. N. Heisner, Mr. and Mrs. W. K. Hendricks, H. R. Heuer, Mr. and Mrs. Chas. Hirschbuhl, Mr. and Mrs. H. F. Hoehne, Clyde F. Holcomb, W. F. Holzer, Mr. and Mrs. O. L. Hudrlik, J. D. Hyde, Miss Beverly Imus, Mr. and Mrs. W. C. Jacoby, E. M. Jahraus, Joe Jenkins, Mr. and Mrs. J. Johnson, Ray Johnson, Lyal Jones, J. D. Kaster, Mr. and Mrs. Dan J. Keating, Ernie Kertz, Mr. and Mrs. Glen King, V. Lache, Mrs. Jack Lacey, Mr. and Mrs. Loren A. LaFond, Mr. and Mrs. E. E. Langsden, R. M. Lehman, A. R. Lindsley, Mr. and Mrs. K. G. Lineham, Mr. and Mrs. W. Little, Mr. and Mrs. J. G. Long, Mr. and Mrs. Gus Lorenz, R. P. Lungreen, Mr. and Mrs. C. J. McAllister, A. C. McCorry, Mr. and Mrs. L. D. McGlothlin, P. J. McGuire, F. A. McKay, Mr. and Mrs. Frank W. McKenzie, Mr. and Mrs. Leonard McMaster, A. E. Maahs, Milton J. Maguire, Mr. and Mrs. Wm. C. Marshall, Ralph Mateil, H. G. Merrick, R. G. Mispley, J. H. Moak, T. E. Moffitt, Mrs. Reva Montgomery, Robert Montig, Mr. and Mrs. C. W. Morden, Mr. and Mrs. O. P. Morgan, Mr. and Mrs. D. C. Morris, Mrs. G. H. Mount, R. A. Murray, Ben E. Natwick, Mr. and Mrs. A. G. Natwick, Mr. and Mrs. Art Newcomb, Mrs. Ann Newkirk, Mr. and Mrs. Austin Nickels, S. Norman, Mr. and Mrs. M. E. Norwood, Mr. and Mrs. Gus Ostenson.

Mr. and Mrs. Art Palmer, Mrs. Edith Peachy, H. T. Peterson, R. T. Petrie, Mr. and Mrs. J. C. Plankinton, Mr. and Mrs. Ralph K. Pratt, Al Quinn, Mr. and Mrs. Ralph Reid, H. H. Richmond, H. C. Ricker, Mr. and Mrs. W. D. Rigg, Raymond Rivera, Mr. and Mrs. E. J. Roake, J. M. Ruck, Mr. and Mrs. S. A. Salmonsen, W. A. Salmonson, Mark Sanford, Mr. and Mrs. Jack Savage, B. W. Sawyer, W. F. Schelton, H. Schmitz, Mr. and Mrs. John Schuh, Mr. and Mrs. E. Schweitz, Mrs. George Shaw, Brian Shera, Mrs. W. J. Shelton, Mr. and Mrs. D. L. Shirley, Carl Sholdebrand, Carl Shouderback, H. N. Simpson, J. F. Smalley, Larry Smith, Ray Smythe, George Spencer, G. Sporre, E. W. Stribling, Mr. and Mrs. R. E. Strommer, Mr. and Mrs. Virgil Sutherling, M. W. Thom, E. H. Tidland, Mr. and Mrs. R. M. True, W. Van Beckman, Mr. and Mrs. Preston B. Varney, H. A. Vernet, R. D. Waddell,

H. J. Wagner, Harold Wall, Mr. and Mrs. T. J. Waltman, L. H. Wear, E. A. Weber, Fred Weleber, Mr. and Mrs. J. W. Wenger, Mr. and Mrs. E. N. Wenneberg, Mr. and Mrs. Rex West, Mr. and Mrs. Jack Weiyblen, Mr. and Mrs. O. C. Wheeler, Mr. and Mrs. J. A. Wilcox, J. M. Wilcox, Mr. and Mrs. Peter M. Wilkie, Mr. and Mrs. W. H. Williamson, Mr. and Mrs. D. D. Wilma, Mr. and Mrs. M. A. Willson, Mr. and Mrs. Albert Wilson, James A. Wilson, J. B. Wilt, Mrs. Winters, Z. A. Wise, Mr. and Mrs. Edward P. Wood, L. F. Wray, H. Wyman, Mrs. H. Wymore, Mr. and Mrs. E. V. Young, H. A. Zirbel.

Liquid Tight Package Group Meets

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 28, 1944—The desirability of an order to channel allocated pulp to the most needed products was discussed at the first meeting of the Liquid Tight Paper Container Industry Advisory Committee, the War Production Board said today.

In view of the critical pulp supply, committee members concurred with the necessity for a proposed order which would temporarily eliminate the use of liquid tight paper containers for packing products, for which containers made from board with high pulp content are not necessary.

Members of the new committee are: S. A. Beer, Miro Container Company, Brooklyn, N. Y.; A. W. Stompe, Menasha Products Company, Menasha, Wis.; W. R. Harris, Michigan Paper Tube and Can Company, Detroit, Mich.; George T. Hynes, Champion Container Company, Philadelphia, Pa.; R. E. Rutledge, Sutherland Paper Company, Kalamazoo, Mich.; Harry M. Gray, Sealright Co., Inc., Fulton, N. Y.; E. R. Van Meter, Continental Can Company, New York, N. Y.; H. J. Wallace, Fonda Container Company, Inc., St. Albans, Vt.

R. F. Segur, was the Government presiding officer of the Containers Division.

C. E. Thoresen Elected Secretary

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., June 26, 1944.—Carl E. Thoresen, Cambridge Paper Box Company, was elected secretary of the Boston Chapter, National Association of Cost Accountants at the annual meeting held recently at the Hotel Vendome.

WANTED: PAPER PRODUCTS

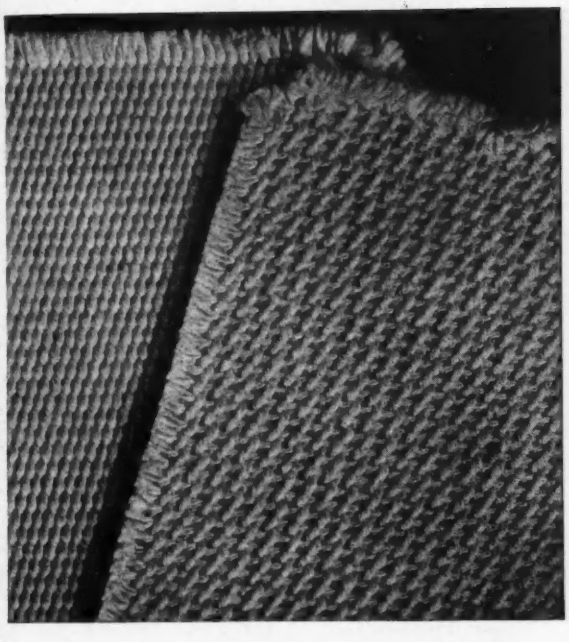
EXECUTIVE

Large corporation is seeking man with proven managerial ability to act as assistant to manager of San Francisco office. Prefer man 30-40 with knowledge of paper products and paper manufacturers. Procurement and promotional experience desirable. Work will involve some travel. This permanent position offers salary commensurate with responsibility and an attractive future. In reply give age, draft status, and full details concerning education and employment. Correspondence will be held in confidence. If preferred, you may reply through a third party. Address Box 44-438, care Paper Trade Journal. J-29

BRANDON

DRYER

FELTS



Manufactured from the raw cotton to the finished felt

BRANDON EXTRA

TRI-UMPH all cotton, 3 ply 53 oz., widths up to 250".

ZEPHYR all cotton, 3 ply 45 oz., widths up to 196".

ZEPHYR cotton-asbestos 3 ply Face 50% asbestos, back open construction for high porosity. Widths up to 166".

HINDLE S/54 all cotton special weave. Extra heavy duty Preshrunk, high porosity, widths up to 170".

SCAPA-HALL S/46 and S/46A. Available after VICTORY.

Sole Sales Agents

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117 W. Baltimore St.

Baltimore, 1, Md.

Representatives:

J. S. Harrington, Watertown, N. Y.
C. B. Smith, Kalamazoo, Mich.
Christian Co., Richmond, Va.
D. H. White, Standard Supply Co., New Orleans
Frank P. Wilder, Portland, Ore.
James A. Taylor & Son, Portland, Maine

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending June 24, 1944

STOCKS

	High	Low	Last
A. P. W.	4¼	3	4¼
Armstrong Cork Co.	44¾	42¾	44⅜
Celotex Corp.	14⅞	14½	14⅞
Celotex Corp., pf.	18¼	17¾	18¼
Certain-Teed Products Corp.	7¼	6	7⅛
Certain-Teed Products Corp., pf.	76⅜	68¼	76⅜
Champion Paper & Fibre Co.	26¾	26	26½
Champion Paper & Fibre Co., pf.	113	112½	112½
Congoleum Nairn Co.	27⅜	26	26¼
Container Corp. of America	25¾	25⅛	25¼
Continental-Diamond Fibre Co.	12⅜	11⅜	11⅞
Crown-Zellerbach Co.	18⅜	17⅜	18⅜
Crown-Zellerbach Co., pf.	100	99⅜	100
Dixie Cup Co.	17⅛	17	17
Dixie Cup Co.—A	46¼	45	46¼
Flintkote Co.	26¼	24½	25½
Flintkote Co., pf.	107	106	107
Robert Gair	4¼	4	4¼
Robert Gair, pf.	15	14¾	14¾
International Paper Co.	18⅜	17½	18⅛
International Paper Co., pf.	84	83⅜	83⅜
Johns-Manville Corp.	100	98	98
Johns-Manville Corp., pf.	....	....	....
Kimberly-Clark Corp.	....	....	....
MacAndrews & Forbes	28½	28⅛	28⅛
MacAndrews & Forbes, pf.	138	138	138
Masonite Corp.	48	47¼	47¼
Mead Corp.	11¼	10⅜	11¼
Mead Corp., pf. A-6%	93	93	93
Mead Corp., pf. B-5½%	81	80½	81
National Container Corp.	17	16¼	17
Paraffine Companies, Inc.	57	56	56⅛
Paraffine Companies, Inc., pf.	....	....	....
Rayonier, Inc.	16½	15⅝	16½
Rayonier, Inc., pf.	32½	32	32½
Ruberoid Co.	30⅞	30	30½
Scott Paper Co., pf.	111½	110¼	110¼
Scott Paper Co.	42	41½	41½
Sutherland Paper Co.	33	33	33
Union Bag & Paper Corp.	12½	11½	12⅜
United Paperboard Co.	5⅝	5¼	5⅜
U. S. Gypsum Co.	86	83	86
U. S. Gypsum Co., pf.	174	174	174
West Virginia Pulp & Paper Co.	25¾	23½	25½
West Virginia Pulp & Paper Co., pf.	107	106¼	107

BONDS

Abitibi Pulp & Paper Co. 5s '53	79½	79¼	79¼
Celotex Corp. 3¾s '55	103¾	103¼	103¼
Certain-Teed Products Corp. 5½s '48	102	101½	102
Champion Paper & Fibre Co. 4¾s '50	....	....	....
International Paper Co. 6s '55	108	108	108
International Paper Co. 5s '47	104	103⅝	104
Mead Corp. 3½s '53	....	....	....
West Virginia Pulp & Paper Co. 3s '54	....	....	....

New York Curb Exchange

High, Low and Last for Week Ending June 24, 1944

STOCKS

	High	Low	Last
Great Northern Paper Co.	35⅜	34½	34⅝
Hummell-Ross Fibre Corp.	6⅛	5½	6
St. Regis Paper Co.,	5½	5	5½
St. Regis Paper Co., pf.	161¾	158	161¾
Taggart Corp.	6	6	6

BONDS

American Writing Paper Co. 6s '61	100¼	100¼	100¼

Files Appeal in Abitibi Case

TORONTO, Ont., June 26, 1944—Wright and McMillan, on behalf of the liquidator of Abitibi Power and Paper Company, Ltd., have filed notice of motion asking leave to appeal from the judgment of Mr. Justice Kellock ordering an accounting regarding various liabilities of the company. At a hearing of the motion on Wednesday at Osgoode Hall it was ruled that the hearing should be postponed until September. It was stated that there had been no settlement of the order by the registrar and that this necessitated delay in the hearing.

Nekoosa-Edwards Votes Dividend

A dividend of 50 cents per share of common stock has been declared by the Nekoosa-Edwards Paper Company, Port Edwards, Wis., it was announced last week by John E. Alexander, president and general manager.

Visit American Writing Mills

HOLYOKE, Mass., June 26, 1944—The Printing Craftsmen's Club of Boston, with 22 members present, visited the plant of the American Writing Paper Corporation recently. L. M. Yoerg, president of the corporation, welcomed the guests, who arrived at

VISITORS TO AMERICAN WRITING PLANTS

Seated right to left: 1 Joseph F. Holmes, 2 Amos Miller, 3 A. Gordon Ruiter, 4 George Petersen, 5 John F. Sullivan, 6 Norman Mahan, 7 Emanuel Freidman, 8 C. J. Neidel, 9 L. M. Yoerg, 10 W. J. Norton, 11 Henry Johnson, 12 C. H. Cooley. Standing right to left: 13 John Hofling, 14 George Hammer, 15 George McLaughlin, 16 Tom Mahoney, 17 Carl Nelson, 18 John Donohue, 19 J. H. Cohen, 20 R. J. Hemphill, 21 Minter Pickering, 22 Elmer Jenkings, 23 William Law, 24 Frank Nicholson, 25 F. A. Curtis, 26 J. G. McNaught, 27 J. H. Sweet, 28 Frank Lightbown, 29 Frank Madden, 30 R. H. Welsh, 31 J. G. Sinclair, 32 Shel Bradley, 33 R. L. Day.

Holyoke at 12 o'clock. After a buffet luncheon at the Roger Smith Hotel, they went through the Linden Division, where they saw bond papers being made. They also visited the Gill Division or the board mill. Dinner was served at the Roger Smith Hotel and the party left at 7:30 after a very good time.

Colombia To Build Box Plants

Plans are being formulated for the establishment of a series of three plants in Colombia for the manufacture of all types of cardboard boxes and heavy packing cases, according to a report to the Department of Commerce. Prospective locations are Barranquilla, Cali and Medellin. A corporation has been formed under the joint capitalization of Colombian firms and a prominent United States company and when established, these proposed factories will operate under the direction of United States technicians.

Experiments in the use of bagasse as a raw material are now being carried out but in the event of failure of these experiments, further study will be devoted to the utilization of numerous native fibrous grasses and plants which grow abundantly in this region.

Added to Board of Celotex

Bror Dahlberg, president of the Celotex Corporation, announces the election of Andrew J. Dallstream and William D. Hart to fill vacancies on the board of directors caused by the resignations of John G. Getz, Jr., now a major in the Army, and Lee B. Ewing, who has retired. Mr. Dallstream is a partner in the law firm of Pam, Hurd & Reichmann of Chicago and Mr. Hart is president of the National Brass and Copper Company of Lisbon, Ohio.

National Chemical Show

Recent surveys indicating that nearly every manufacturing process involves chemistry in some way will materially influence the selection of speakers for the National Industrial Chemical Conference, which will be a feature of the Third National Chemical Exposition to be held in the Coliseum at Chicago, Nov. 15 to 19, it is announced by the program committee.

The conference and show are sponsored by the Chicago Section of the American Chemical Society.

"Much of interest to executives of manufacturing plants will be revealed at the 1944 show and conference," said Dr. H. E. Robinson, Assistant Chief Chemist of Swift & Company, who is chairman of the program committee.

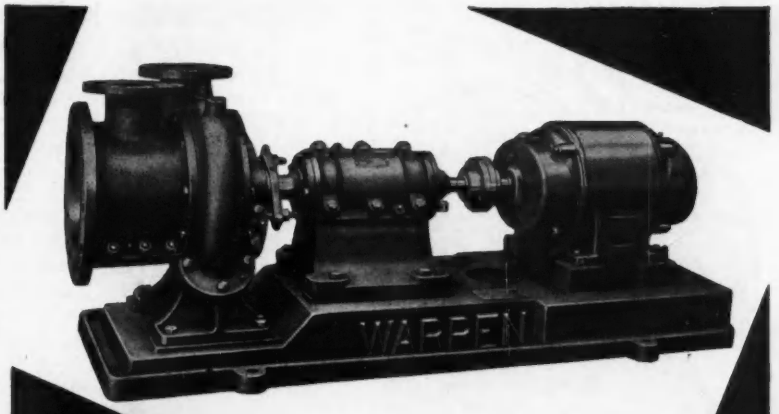
"They will be afforded an excellent opportunity to get better acquainted with developments in applied chemistry and to study an industry which may yield them improved products and lowered production costs. This is more than a theory as attested by the trend among smaller manufacturers to employ chemists as advisers to management for product improvement and quality control and on the part of financial houses to rate such companies as more acceptable long term credit risks."

Conference sessions will be held daily during the five day period in the spacious auditorium on the second floor of the Coliseum Annex, which may be entered direct from the exposition floor. "All under one roof," is the terse announcement for the combined show and conference.

Manager Marcus W. Hinson has arranged with the show committee for an improvised movie theater to be installed on the main floor of the Annex, for a continuous run of interesting, educational and entertaining industrial films.

"The Coliseum provides three times more space than we occupied at our two previous shows held in loop hotels," said Mr. Arveson. "We feel satisfied that the big exposition building, which has been the scene of national political conventions, automobile shows, and other events of major proportions, will fulfill our requirements this year."

The show committee, headed by Mr. Arveson, includes Edward Bicek, Illinois Institute of Technology; Victor Conquest, Armour & Company; L. E. May, Sherwin-Williams Company; C. S. Miner, Jr., Miner Laboratories; R. C. Newton and H. E. Robinson, Swift & Company, and B. B. Schneider, Schneider & Dressler. L. M. Henderson of the Pure Oil Company, Chairman of the Chicago Section, is ex-officio a member of the committee. Headquarters for the show is located at 330 South Wells Street, Chicago 6, ill.



4 OUNCE
TOLERANCE
ON 9 POUND ALL RAG STOCK

. . . met successfully with a
WARREN CENTRIFUGAL MACHINE CHEST PUMP

That's a record. From a full to empty chest, a variation of 12 feet, the output of this Warren Pump* was so steady that required tolerance was easily and consistently met. And the sheet was more uniform than obtained with the plunger pump previously used. Records like this are not exceptional. All Warren machine chest pump installations have been notably successful.

* Installation in a large Eastern mill.

WARREN PUMPS
WARREN STEAM PUMP CO., INC., WARREN, MASS.

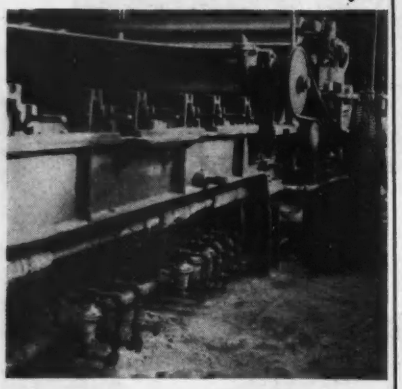
Scotland Lacks Straw

Abundant supplies of straw in Scotland have somehow failed to reach the papermaking centers of that country, according to a report to the Department of Commerce, and a shortage of this papermaking material has been reported by the industry.

In general, paper makers regard straw as a wartime substitute for better papermaking materials and the industry normally consumes less than 350,000 tons, a minute percentage of the United Kingdom's total output.

However, because of the lack of other raw materials, the demand for straw has been magnified and farmers are now being urged to make available for immediate delivery to paper mills the supplies of wheat and oat straw lying on their farms.

20% Faster Heating



of corrugating machine with ARMSTRONG UNIT TRAPPING

THE ability of Armstrong Unit Trapping to aid any phase of paper making requiring steam is evidenced by this report from Toronto Containers Gair Co.:

- 20% Reduction in Heating Up Time
- Roller Temperatures More Even
- No Surges
- Less Back Pressure

These things mean more production, steam and fuel savings, better work. Buy the traps that do a *complete* job, providing automatic removal of condensate *and air*, no steam leakage, low maintenance. Write today for Catalog H, 3rd edition—a handbook on condensate drainage practice.

ARMSTRONG MACHINE WORKS

818 Hoffmann St. Three Rivers, Mich.

ARMSTRONG-STAMM PAPER MILL ENGINEERING DIVISION

Veteran Forester Retires

One of the first technically-educated foresters in the United States, Captain I. F. Eldredge retires from the Forest Service, U. S. Department of Agriculture, at New Orleans, La., on Friday, June 30. After almost 40 years of forestry experience from coast to coast, he leaves the staff of the Southern Forest Experiment Station which he has served as director of the forest survey of the Lower South since 1932.

Captain Eldredge's first assignment after completing his schooling at Biltmore Forest School, North Carolina, in 1905, was on the Sierra National Forest in California. From the high Sierra he was transferred in 1909 to the pine forests of Florida, serving for 8 years as supervisor of the newly created Choctawhatchee and Ocala National Forests. During this period, he developed and put into practice methods of turpentining now generally used throughout the naval stores belt.

At the commencement of World War I, Captain Eldredge entered the first officer's training camp at Ft. McPherson, and was commissioned a Captain of Engineers. He was assigned as a company commander in the 10th (Forestry) Engineers and served for 18 months in the A.E.F. in France. After the War, he returned to the Forest Service as Chief of Forest Management in the Eastern Region and a few years later was transferred to the staff of the Chief Forester, Washington, D. C., as a Forest Inspector of Management and Timber Sales work on all of the national forests of the United States.

In 1926, Eldredge resigned from the Forest Service to accept employment as manager of Suwanee Forest for the Superior Pine Products Co., an industrially-owned and operated private forest property of 200,000 acres in southeast Georgia. Here he stayed for 6 years, engaged in the production of naval stores, lumber, and other wood products.

When the Federal forest survey of the South's timber resources was launched in 1932, Eldredge accepted the regional directorship of that organization, on the staff of the Southern Forest Experiment Station. During the last few years he has also directed the Station's forest economics studies, and more recently has headed up the lumber industry survey in the Lower South for the War Production Board. He is well known as an authority on the South's timber resources and is the author of numerous publications.

Eldredge has been active in the Society of American Foresters, which organization recently paid him the signal honor of elevating him to the rank of "Fellow." After his retirement, "Cap," as he is affectionately known to his many friends throughout the country, will live in New Orleans, where he can continue to maintain his contacts with foresters and forestry activity in the South.

Resumes Reforestation

Resuming its reforestation program, Bloedel, Stewart & Welch, big logging operators on Vancouver Island, B. C., have planted 500,000 trees this year, bringing their total to over 1,000,000 trees since the program was started in 1938.

The company has been reforesting portions of its logged-off land under supervision of John Mottishaw, graduate of University of Washington Forestry School. Owing to the war, planting was suspended for 1942 and 1943, but this year 425,000 trees were planted at Franklin River and 75,000 in the Great Central Lake area. This is the first large planting in the Franklin River area.

Some 800 acres have been developed this year at a cost of $10 an acre. Part of the work was done by 39 high school students of Port Alberni as part of their reforestation program.

Mr. Mottishaw says these trees in 130 years would reach the peak of their productivity in merchantable timber.

India's Paper Industry

India's paper industry struggled through 1943 under the most adverse conditions yet reported, according to a report received at the Department of Commerce. Local capacity was limited not only by shortages of raw materials but the entire industry was handicapped by labor difficulties and the declining of available coal.

Imports of paper and stationery during the period April to October 1943 fell to less than one-half the value of imports in the same months of 1941 and attained only 70 percent of the comparable figure for 1942. This serious drop in paper stocks at a time when demands of government and industry alike were highly accelerated was, in a sense, catastrophic.

Valiant efforts were made to increase the meager local production and to counteract drastic cuts in imports by broadening the scope of production to include newsprint and several other types of paper never before produced in the country.

Curtis Waste Paper Drive

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., June 26, 1944 —Backing the Allied invasion of Europe with an "invasion drive" for waste paper to help meet the increasing critical need for blood plasma kits, ration containers and other military packaging, employes of the Curtis Publishing Company, in one week, brought into the plant 60,708 pounds of old newspapers and magazines.

In two months the Curtis employees have sent 318,117 pounds of waste paper to war and provided $3,423.79 for furnishing recreational needs and added comforts of the wounded soldiers and sailors through the Camp and Hospital Council of the Red Cross. The employees brought into the plant 188,004 pounds of scrap paper of all kinds, and the remainder, 130,113 pounds, were reported donated at their homes, for which the Company contributes a cent a pound to the fund for aiding wounded servicemen.

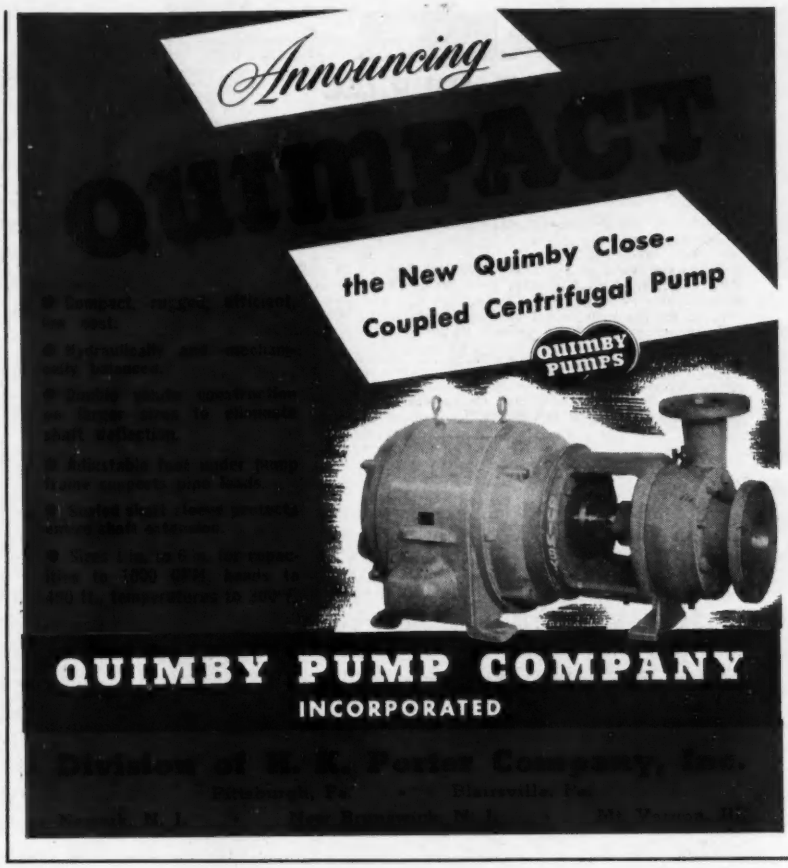
It all started with employees being asked to bring in one old newspaper and one old magazine each day to help meet the critical military needs, the paper to be sold through a regular scrap dealer and the proceeds devoted to benefiting the wounded.

But that was not enough for the patriotic employes. They dug into their cellars and attics. They tapped the hoards of their neighbors. They enlisted their parents or their children. Neighborhood stores were canvassed and the merchants either sent their waste paper to war through Curtis employees or became waste paper conscious on their own.

In the beginning employees came to work with waste paper in bundles under their arms. But as the compaign developed into a friendly competition between departments and groups within departments to demonstrate which could do the most patriotic job, special conveyances frequently became necessary. One employee used a baby buggy to bring in waste paper located in a nearby church. Others have hired taxis, borrowed trailers and trucks, as well as utilized share-the-ride automobiles. The climax came one day last week when a girl arrived atop a horse-drawn wagon, loaded with waste paper from her neighborhood.

The spirit of competition was injected early. One shift in the Plate Service department decided to show employees of the rest of the Company what they could do. In one day they carried in from home, by street car, bus and subway 1054 pounds of scrap paper.

That was twice as much as all employees brought in during the first week of the campaign.



Indianapolis Demand Heavy

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., June 26, 1944 —Wholesale demand for paper continued in this territory last week in such volume as to preclude filling all orders. Just what percentage could be filled varied with the individual wholesale house. The demand was spread over most of the grades with no particular emphasis on any one, with the possible exception of kraft. The supply of kraft in this territory is very limited and those jobbers who have mill connections that still are making kraft, say there is no indication of a betterment in the situation. Mills making kraft have service connections that are taking most of their stock and the local jobbing trade is able to get only the little that is left and that is not nearly enough to meet demands.

Box and container factories in this territory continued to produce to the limit of their labor and raw material capacity last week. The real bottleneck in production is the labor situation. Most of the local plants are producing for the armed forces and are able to get priorities on raw materials, but they have been unable to recruit their labor forces in proportion to the increase in possible production. They are at a distinct disadvantage here because of the competition of direct war industries which pay more salaries and wages than the package plants are able to meet.

Swiss Paper Demand Drops

In November 1943, for the first time since the beginning of the war, Swiss paper manufacturers experienced a reduction in the demand for their products, says a report received at the Department of Commerce. Wholesalers indicated a hesitancy toward the maintenance of large inventories as a result of this decline in general consumption.

Newsprint quotas were raised during the period October-December 1943 from 80 to 100 percent of basic contingents with the warning, however, that due to uncertain coal supplies, an eventual drop in production must be expected.

PAPER
TRADE JOURNAL
Title Reg. U. S. Pat. Off.
Henry J. Berger, Editor

COMING EVENTS IN PAPER INDUSTRY

New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Delaware Valley Section. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.

Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each montlr at the Conway Hotel, Appleton, Wis.

Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

Chicago Professional Paper Group—First Monday of each month except July and August at Chicago, Ill.

NEWSPRINT

Newsprint production in the United States and also in Canada, has been downward in trend since 1940 and continues to date. For May 1944, the News Print Service Bureau reported United States production was 60,909 tons and shipments, 62,319 tons; Canadian output, 262,467 tons, and shipments, 276,054 tons; while Newfoundland production was 23,828 tons, with shipments of 12,842 tons. American newsprint mills produced 51,263 tons in the first five months of 1944, or 15% less than in the first five months of 1943. Canada produced 47,750 tons more in the like period over last year, and Newfoundland output was 1.8% more in the first five months of 1944 than in the same period in 1943.

The total amount of newsprint originally estimated to be available to United States publishers and other consumers during the second quarter was 834,000 tons, the Department of Commerce states in its latest report. This included scheduled production of 180,000 tons in the United States and 600,000 tons in Canada for shipment to the United States; 39,000 tons in Newfoundland for shipment to the United States, plus a carryover of 15,000 tons made in Canada for the United States in the first quarter. However, the next announcement of a two-month experimental period, covering the months of May and June, on the production of 30-pound newsprint for United States publishers may result in a smaller available tonnage if these publishers order appreciable amounts of the lighter weight paper. An agreement between representatives of the War Production Board and the Canadian Newsprint Administrator for 30-pound newsprint by Canadian mills was announced on April 21. This action was taken after consultation with the Newspaper Publishers Industry Advisory Committee in the United States, and the Canadian Newsprint Industry Advisory Committee. Manufacture of both 30-pound and the standard 32-pound newsprint will be carried on during May and June, in order to study problems involved in the production and distribution of both weights of newsprint. Following the experimental period, during which United States publishers are privileged to order either weights of paper, the data on usage will be studied by the War Production Board.

The Department's report explains that the former agreement on the part of Canada to furnish 200,000 tons of 32-pound newsprint has been suspended during the experimental period ending this month, and it has been arranged that Canadian production will be planned monthly on the basis of actual orders placed by American publishers and certified in accordance with limitation orders. Every effort will be made to see that each publisher still gets his full quota tonnage if any reduction in Canadian production results. Arrangements were also made between the Office of Price Administration and the Wartime Prices and Trade Board of Canada, whereby Canadian newsprint producers, as well as domestic newsprint mills, will receive an additional $4 a ton for 30-pound newsprint for a 90-day period commencing May 1.

In commenting on the proposal to substitute 30-pound newsprint for the standard 32-pound weight, the Department report states that it has not been favored by Canadian authorities, who are of the opinion that the volume of newsprint which can be exported from Canada to the United States is likely to be reduced if such a shift is made. A preliminary study of the problems of production and distribution involved was made between February 25 and April 21. The study was made with a view to ascertaining the production that can be expected from each available newsprint machine under current conditions of labor, wood supply, electric power, and machine capacity. At 100% capacity on 32-pound newsprint the Department's table indicates an output of 200,000 tons, while 100% on 30-pound newsprint will involve an aggregate loss in tonnage of 8.7%; while at 70% capacity on 30-pound paper will result in an estimated loss of 6.1%; and at 50% of capacity a loss of 4.3% is estimated.

Under actual operating experience, the report points out, some technical improvements in production may be possible in the manufacture of both weights. However, concentration of the newsprint industry by Government order, manpower shortages, diversions of electric power for war purposes, the situation as to pulpwood supplies, and the economical use of newsprint machines are limiting factors on Canadian production. Orders of United States publishers for May totaled 206,339 tons, comprising 112,436 tons of 32-pound paper and 93,903 tons of 30-pound paper. The extra 6,339 tons of these orders over the previous commitment of 200,000 tons, now suspended, will be absorbed from surplus remaining in Canada from the first quarter. United States newspaper publishers who have ordered over 100 tons of 30-pound newsprint for May were asked by the War Production Board to reduce their Canadian orders for this weight by 10%, in order to balance

the Canadian production in the first month of the sixty-day test period.

From the schedule of tonnages representing orders of 32 and 30 pound paper, as cited in the study in a former paragraph, is indicated certain levels on the basis of the different orders. On the basis of this schedule, it would be necessary for United States publishers ordering 30-pound paper to take an 8.75% reduction during May. However, the Department points out, it is impractical to reduce orders of 30-pound paper when only a carload or two is ordered, if less than carload shipments are to be avoided. All newspapers ordering more than 100 tons of 30-pound newsprint have been asked to cut their orders for May delivery by 10%. Any resulting shortages can be made up out of the publishers' own inventories. The reduction in 30-pound tonnage in June will be the same as in May, 10% on all orders over 100 tons a month. The estimated monthly newsprint production and percentage distribution of sales by end-users for the second 1944 quarter are as follows: Government, 3.0%; Defense Plants, 0.06%; Communications and Public Service, 80.0% Agricultural, 0.02%; Manufacturers of Civilian Goods, 9.4%; Retail, 0.06%; and Miscellaneous, 16.6%.

New Car With Paper-Based Plastics

Fireproof, paper-based plastics are being used in the construction of a new kind of railroad baggage car, according to a report to the Department of Commerce. The new car is twenty percent lighter than older styled cars.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1944		Corresponding Weeks—1943	
May 13	89.6	May 15	91.1
May 20	91.6	May 22	92.2
May 27	91.7	May 29	91.8
June 3	88.3	June 5	84.7
June 10	91.5	June 12	88.0
June 17	92.8	June 19	87.0

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1943	87.2	88.9	89.5	88.7	91.4	84.8	84.3
1944	89.6	89.6	90.1	89.5	*90.9*	...	...

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1943	91.0	88.3	89.6	89.6	82.0	87.8

COMPARATIVE YEARLY SUMMARIES

	1937	1938	1939	1940	1941	1942	1943	1944
Year to Date....	89.1	67.4	79.6	86.8	93.1	99.7	88.8	*90.4*
Year Average....	79.8	71.5	83.4	85.6	97.4	90.4	87.8	...

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOAD OPERATING RATIOS†

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1938	56	63	63	60	60	59	59	69	70	73	67	61	64
1939	65	73	76	74	69	73	68	77	82	91	88	77	77
1940	78	75	74	76	82	85	77	79	78	85	83	77	78
1941	81	88	89	89	91	94	93	98	95	99	98	90	92
1942	102	101	101	95	82	72	68	75	76	81	82	77	84
1943	86	88	94	94	96	94	89	96	94	94	93	87	93
1944	90	96	95	96	*96*	..	..	..	..	..	..	..	..

Week ending May 13, 1944—95
Week ending May 20, 1944—97
Week ending May 27, 1944—96
Week ending June 3, 1944—93
Week ending June 10, 1944—96
Week ending June 17, 1944—95

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

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Surface Activity and Its Application to Paper*

By John J. Miskel[1]

Abstract

The processing of paper is considered to be primarily a water-borne operation in which surface activity plays an important role. The present and expanding use of surface-active chemicals in the modification of the characteristics of various interfaces as they occur in paper fabrication is discussed as a function of the chemistry, properties, limitations, and advantages of representative members of the following classes of commercially available products:

Anionic Surface-Active Agents—soaps, sulphated oils and aliphatic esters, sulphonated oils and aliphatic esters, aliphatic alcohol sulphates, alkyl sulphonates, ester sulphates and sulphonates, fatty-amide derivatives, and alkyl-aryl sulphonates.

Cationic Surface-Active Agents—alkyl amines, alkyl amine salts, and quaternary ammonium salts.

Non-Ionic Surface-Active Agents—polyhydroxyl alcohol esters, ethylene oxide polymers, and polyvinyl alcohol.

Cellulose, because of its property of hydrating in water, and its otherwise limited adaptability to chemical processing *(1)*, has since antiquity been converted into paper as a water-borne operation. It seems incongruous that the paper industry—thus dependent upon colloidal phenomena—has not utilized to a greater extent the water-modifiers which are popularly referred to as "surface-active agents."

The relatively limited use of surface-active compounds in paper fabrication may be due in part to the physics of the operations peculiar to the industry and to the economics inherent in handling large volumes of water. However, it is certain that there still remains considerable opportunity to use profitably the various surface-active compounds that are now available. It is proposed here to list these compounds and to include a brief discussion of their properties, their individual advantages and limitations, their current use in paper processing, and in some cases the future possibilities that would seem to be worthy of investigation.

Surface-active compounds are so termed because their functions are apparent only from the effects they have on the surface or interface present between any two or among several phases existing in contact with one another. Examples of common interfaces or surfaces are those between a liquid and air, between a liquid and another liquid, between a liquid and a solid, between a solid and air or other gas, or any combination of these in a heterogeneous system.

The identifying term given to compounds having surface-modifying characteristics seems even more apt when it is considered that they concentrate at the various interfaces, changing the characteristics of the surface or interface wherein they concentrate. These modifications may be observed in such common phenomena as emulsification, dispersion, flocculation, deflocculation, detergency, wetting, capillarity, surface-tension reduction, foaming, defoaming, flotation, penetration, water repellency, and so forth.

Surface-active compounds are characterized by a balance between a hydrophobic, or hydrocarbon, fragment and a hydrophilic, or polar, fragment having water affinity or solubility. Such molecules orient at a given surface or interface so that the hydrophilic portion projects into the aqueous phase and the hydrocarbon portion enters into or affixes itself to the other component comprising the system under consideration *(2)*.

Surface-active compositions are divided into three broad classes, depending on the way they ionize. They are classified by the ionic character of the hydrocarbon group and how it would migrate in an electrolytic cell.

$$\underset{\text{Anionic}}{RCOONa \rightleftarrows RCOO^- + Na^+}$$

$$\underset{\text{Cationic}}{RCH_2.NH_2.HCl \rightleftarrows [RCH_2.NH_2.H]^+ + Cl^-}$$

$$\underset{\text{Non-ionic}}{-(CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2)_x-}$$

Anionic Surface-Active Agents

Eliminating from this discussion such naturally occurring surface-active compositions as gums, colloidal clays, starches, albumens, etc., the synthetic surface-active compounds had their beginning when the value of the alkali salts of carboxylic acids or soaps was discovered. The history of the development of all the other synthetic compounds that are available today stems from the necessity of overcoming some of the more serious drawbacks inherent in the original synthetic soap.

Soap is by far the most widely employed synthetic surface-active compound. In tonnage consumed, soap exceeds the combined volume of all the other compounds designed to improve on soap. In 1942

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the sales of soap in the United States amounted to in excess of 2,930,954,011 pounds *(3)*.

Soap, by definition, is the metallic salt of long-chain fatty carboxylic acids, rosin acids, naphthenic acids, or similar cycloaliphatic acids. Their chemical formula may be represented generally as follows:

MOOC . R

where M is any metal and R characterizes the hydrocarbon fragment. Typical examples are

$CH_3(CH_2)_7CH = CH(CH_2)_7COONa$
Sodium Oleate

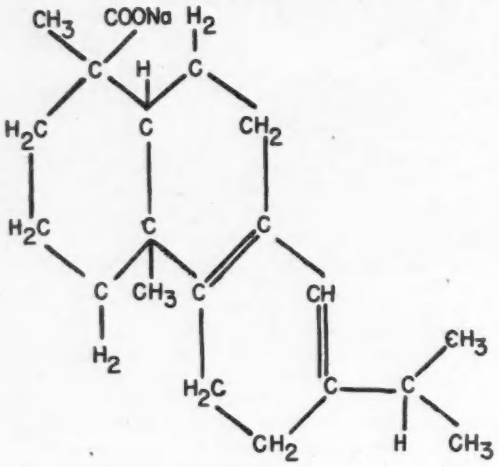


FIG. 1
Sodium Abietate

The chemical and physical properties of soaps depend directly on the molecular weight, melting point, molecular configuration, and degree of unsaturation or substitution of the organic acids used in their manufacture, as well as the molecular weight and valence of the metallic component. For instance, all the potassium and sodium salts of the rosin, naphthenic, and fatty acids are soluble in water. The soaps of the shorter-chain saturated fatty acids and the longer-chain unsaturated acids are readily soluble at room temperature, while those of the long-chain saturated higher-melting or higher-titre acids are not quickly soluble at room temperature. These higher-titre soaps have a tendency to form heavy gels on the cooling of their solution. Likewise the wetting foaming, detergence, and emulsification powers of the soaps depend to a great extent on the chain length or character of the acids used, e.g., the coconut fatty acid soaps are the best foam producers, while the oleic acid and stearic acid soaps are the better emulsifiers and detergents. Soaps of fatty acids containing two or three double bonds or hydroxyl groups are poorer surface-active compounds because of the presence of these hydrophilic groups, which upset the balance of the molecule.

Soaps as a group have relatively low-effective solubilities in cold water, with the exception of the alkali and amine soaps in the C_8-C_{12} range. Solubility decreases with a rise of molecular weight and increases with a rise in temperature, with increase in molecular complexity, and with the number of double bonds present. The solubility of soaps with respect to their alkali radical decreases in the order from NH_4 through K to Na. Salts of branched-chain acids and those containing hydroxyl or similar hydrophilic groups have increased solubility. *(4)*.

The viscosity of soap solutions is a function of concentration and temperature. Cold dilute solutions or fairly strong solutions at elevated temperatures are relatively fluid, while more concentrated solutions increase in viscosity with a drop in temperature from 100°C. to a point where they set to a stiff gel. The viscosity is lowered by the addition of small quantities of electrolyte. Further additions cause a rise in viscosity and, finally, separation or "salting out" *(4)*.

The wetting powers of soaps are good, particularly in the case of the more soluble C_8-C_{12} saturated fatty acid soaps, the unsaturated fatty acid soaps, branched-chain fatty acid soaps, and those containing hydroxyl or keto groups on the aliphatic portion. A 0.002 *N* sodium oleate solution has a surface tension of 24.3 dynes per cm. at 20° C. The lowering of surface tension by soap reaches a minimum, after which further additions have no effect. The change in interfacial tension is more proportional to the amount of soap added *(4)*.

In soft waters, soap is an economical and efficient detergent. Its detergent power increases from a chain length of C_{12} to C_{18}, soaps of C_{18} acids being the most efficient. Soaps containing several points of unsaturation, branching, or additional hydrophilic groups (such as hydroxyl) usually are poor detergents.

Solutions of soap have a pH of 10 or higher. Below this point they begin to decompose. Ammonia, morpholine, and mono-, di-, and triethanol amine soaps may be used at a somewhat lower pH.

In the presence of alkaline earth and heavy metal salts, alkali soaps are precipitated as insoluble salts of these metals. This is probably the most serious disadvantage possessed by soaps—that is, their ineffectiveness in hard waters where it is necessary to precipitate all the calcium and magnesium salts as insoluble soaps and then add further soap in order to obtain the desired wetting, emulsification, or detergency. This effect may be overcome to some degree by the use of calcium sequestering agents or water softeners.

To summarize, it might be said in the way of comparison that the advantages of soap are its low cost, its availability in large quantities, its good wetting and detergent properties under certain conditions, and its value as an emulsifier and dispersing agent under similar conditions. Its disadvantages, while not many, are serious and include the high pH of its solutions, relatively poor solubility (particularly of the higher saturated-chain fatty acid soaps), its precipitation by hard waters, its instability in acid, and the high viscosity of its solutions.

In the paper industry, soap has found considerable application. Rosin soaps are used in sizing. Fatty acid and rosin soaps are used in preparing the resin, wax *(5)*, and bitumen emulsions employed in sizing industrial paper products and as adhesives in laminating industrial board products. Soluble soaps are used in waerproofing paper products through their beater- or pulp-precipitation as insoluble metallic soaps by the addition of alum, calcium, or other salts *(6)*. Of particular significance is the use of high-titre soaps in this fashion to size asbestos paper where the strong alkalinity and buffer action of the asbestos fiber makes the use of rosin size unsatisfactory because of a resultant loss in waterproofness. Alumi-

num stearate precipitated on the asbestos fiber maintains its waterproof character under these adverse conditions. The soap sizing operation can be conducted uniformly with a minimum of alum and without the generation of troublesome foam. The use of high-titre low-iodine-value soaps in sizing photographic paper is important, since the application of the sized paper demands a minimum of discoloration due to normal oxidation or photosensitized oxidation.

Soaps are employed as lubricants in the die-formation of paper cups, containers, and similar pressure-formed articles. They are used as detergents in felt washing *(7)* and may be employed in wetting new felts. Soaps are added to glue surface sizes to improve opacity and to provide a certain plasticizing property. They are also used in casein coating mixtures to improve finish on calendering.

The generally considered water-insoluble metallic soaps possess mild surface-activity, as evidenced by their ability to form water-in-oil emulsions and their wetting and dispersing effects in non-aqueous systems.

In the paper industry, soaps such as aluminum stearate and calcium stearate can be used as dispersions *(8)* to add water repellency to paper products *(9, 10)*, and as defoaming agents. Copper soaps may be used to provide mildew resistance *(11)*, while mercury stearate is said to be germicidal. They also have been used as components of specialty defoaming compositions *(12)* and in waterproofing casein coatings.

The water-insoluble soaps have been used as hot-melt paper coatings. They are employed widely in the wax, varnish, and resin types of moisture vapor-proof coatings. They are also valuable in raising the melting point and increasing the toughness of waxes *(13)* that are to be used as impregnants, adhesives, and coatings. A good many of the metallic soaps fluoresce in different intensities and colors *(14)*. However, as far as is known, no use of this property has been made but it may offer some new possibilities for investigation. One possibility would be specialty-paper advertising displays.

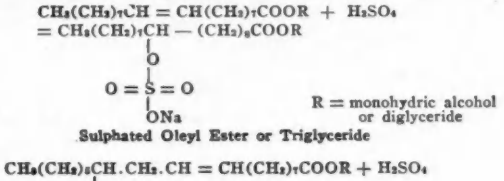
The property of soaps of forming gels in waxes and hydrocarbons *(13)* should be of value in the paper industry as a means of controlling or limiting penetration of wax into paper products. The insolubility of metallic soaps such as calcium and aluminum stearate should be of value in formulating coatings for oil and greaseproof containers. Several of the metallic soaps are not wetted by oil, and oil will not creep or spread on surfaces that have been treated with these soaps *(15)*. Soaps such as chromium stearate, lithium stearate, and some of the sebacates are somewhat soluble in hot water but relatively insoluble in cold water. This would indicate a possibility for their application in gelatin and casein coatings and adhesives where they could be added as hot solutions lending the dried and cold coating or adhesive some added resistance to resolution. Several metallic soaps have been used in treating asphalt to promote adherence to mineral surfaces.

The fact that metallic stearates are good "parting" agents in the manufacture of plastics and rubber should indicate their value as components of paper or container coatings where these paper products are to be used to package resins, rubber, and similar materials. It is our understanding that containers employed in packing "butyl" rubber contain metallic stearates as a component of the parting composition *(16)*. Emulsion-type "parting" agents useful in this type of package manufacture have recently been developed by our laboratories.

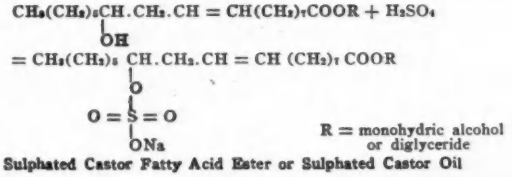
Sulphated Oils and Alphatic Esters

The sulphated oils and esters, which are often referred to improperly as "sulphonated" oils or esters, were developed to offset in part the acid instability and high sensitivity of soaps to magnesium and calcium salts. Sulphated oils and esters are useful as wetting agents and emulsifiers in slightly alkaline, neutral, or acid solutions. They are also effective in the presence of low concentrations of calcium and magnesium salts. Some of the sulphated fatty esters are the most efficient wetting agents, on a cost-performance basis, in neutral solutions—even more so than a good many of the highly publicized proprietary wetting agents now on the market.

The sulphated fatty esters and the sulphated oils *(17)* may be represented, for the purpose of this discussion, by the following formulas, since some degradation, polymerization, lactide-formation, etc., takes place in sulphonating a glyceride:

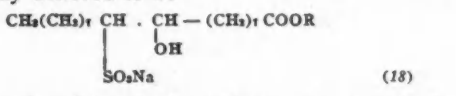


Sulphated Oleyl Ester or Triglyceride



Sulphated Castor Fatty Acid Ester or Sulphated Castor Oil

Sulphated oils or esters are decomposed at elevated temperatures, and by alkali and acid, and on standing in very dilute solutions. Attempts to overcome these difficulties have led to the production of true sulphonates by treatment of the oil or ester with sulphoacetic acid, oleum, chlorsulphonic acid, sulphur trioxide, etc. These oils and esters are very often dark and not too effective as wetting agents. Their structural formula is generally believed to be



(18)

In general, sulphated oils and esters are used advantageously because of their ready availability, low cost, high wetting efficiency in neutral and slightly acid solutions, their unusual lubricating and softening properties, their ability to plasticize water-deposited films and coatings, and their ability to blend with oils, waxes, and resins to form products that are water dispersible with a minimum of mechanical effort.

The disadvantages possessed by sulphated fatty esters and oils include their tendency to precipitate from hard waters, to saponify in strong alkali solutions to form soaps, to hydrolyze in strong acids, to salt out in high concentrations of electrolytes, and to hydrolyze in boiling water.

The sulphated oils and esters have found application in the paper industry as plasticizers for glues, adhesives, and coating compositions, wetting and re-wetting in blotters and toweling, as a softening agent

in paper toweling, as defoaming agents for the concentration of lignin sulphite waste liquors under varying pH conditions, as emulsifiers for sizing and coating emulsions, detergents for cleaning wool felts *(7)*, in pitch prevention *(19)*, in reworking waxed paper *(20)*, and in the top ply of plaster board to facilitate rewetting when the board is to be plastered or coated after installation.

The sulphated oils and esters will be found to be inexpensive and valuable surface-active compositions if they are employed under conditions that take into account their sensitivity to hydrolysis and hard water.

Aliphatic Alcohol Sulphates and Sulphonates

In attempting to block the carboxyl group (—COOH) responsible for the sensitivity of soaps and sulphonated oils to hydrolysis and precipitation in hard water, the long-chain-alcohol sulphates were developed.

The alcohol sulphates are prepared by hydrogenating the corresponding fatty acid or ester to the alcohol and following this by sulphation to produce derivatives having the following general formula *(21, (22)*.

$$RCH_2OSO_2ONa$$

where R may range in chain length from C_8 to C_{18} and may be straight or branch chained. A specific example would be lauryl sodium sulphate, $CH_3.(CH_2)_{10}.CH_2.OSO_2ONa$. While the sulphate radical is usually placed terminally, there are effective commercial surface-active compounds where the sulphate group is more centrally placed in the molecule. A typical example of this type has the formula

$$\begin{array}{l} C_4H_9\underset{|}{C}HC_2H_4\underset{|}{C}HCH_2CH(CH_3)_2 \\ \quad\ \ C_2H_5 \quad\ \ SO_4Na \end{array} \qquad (23)$$

Sulphated fatty alcohols have as advantages little or no tendency to hydrolyze in neutral solutions, they retain considerable surface activity in fairly strong acid solutions, are stable to hard waters, and are effective in alkali solutions at low temperatures. They are good detergents, wetting agents, and foaming agents.

The primary disadvantages of the fatty alcohol sulphates are their high cost and their tendency to hydrolyze in hot alkali solutions.

In paper manufacture, the sulphated fatty alcohols have been used to speed up rag and broke beating operations, as a wetting agent in the moistening water used with sealing tapes, in wetting new felts, and as detergents in cleaning felts. In some cases they have been used to produce specialty emulsions of resins, waxes, and oils for paper-impregnating and coating. They also find use in stabilizing and compounding latex that is used in processing paper, and impregnating paper to make artificial leather and paper midsoles.

The alkyl sulphates are subject to hydrolysis in hot alkali solutions and in alkali solutions used in caustic of the mercerizing strengths. However, several long-chain alkyl sulphonates are commercially available which do not have this weakness. These may be represented by the formula

$$CH_3(CH_2)_{16}\ CH_2SO_3Na$$

$$\begin{array}{ccccccl} & CH_3 & & CH_3 & & & \\ & | & & | & & & \\ CH_3 - & C & - CH_2 - & C & - & <\!\!=\!\!> & OCH_2CH_2OCH_2CH_2SO_3Na \\ & | & & | & & & \\ & CH_3 & & CH_3 & & & \end{array} \qquad (24)$$

Other sulphonates, although cycloaliphatic in nature, may be included in this class. These are the mahogany or naphthene sulphonates obtained by the sulphuric acid treatment of crude petroleum oils of a naphthenic character. Still others are alkyl-ether sulphonates *(25)*.

Products of this type have been used as detergents in felt washing, emulsifiers for coating compositions and adhesives, as wetting agents in kier boiling rags, to improve wetting of surface-staining compositions, wetting agents, or reworking rags and in the stabilization of latex used in paper conversion.

Ester Sulphates and Ester Sulphonates

Several products of this type are prepared by sulphating compounds such as diethylene glycol monolaurate and glyceryl monolaurate. Their formula may be represented as—

$$\begin{array}{l} H_2C - OOC.(CH_2)_{10}CH_3 \\ \ \ \ | \\ \ HC - OH \\ \ \ \ | \\ H_2C - OSO_3Na \end{array} \qquad (26)$$

The sulphonate of the same ester has the structural formula

$$\begin{array}{l} H_2C - OOC.(CH_2)_{10}CH_3 \\ \ \ \ | \\ \ HC = OH \\ \ \ \ | \\ H_2C - SO_3Na \end{array}$$

A product similar in structure to the sulphonate and of commercial importance is generally described as—

$$CH_3(CH_2)_7CH:CH(CH_2)_7COOCH_2CH_2SO_3Na \qquad (28)$$

These products are excellent detergents and wetting agents; however, they have the same limitations with respect to stability in alkali as have the sulphated oils and sulphated fatty esters. Naturally, the sulphonates do not suffer from a tendency to hydrolyze, as does the sulphated product. They are good detergents.

These polyhydroxy ester sulphates and sulphonates have been used in the paper industry as emulsifiers, wetting agents, felt washing detergents, and dispersing agents for the preparation of special coating and sizing compositions. They are relatively inexpensive.

In this class also should be included the highly effective wetting agents, di- *(29)* and tricarboxylic acid ester sulphonates *(30)*. One of the commercial types has the structure

$$\begin{array}{l} C_8H_{17}\ OOC.CH_2 \\ \qquad\qquad\quad\ | \\ C_8H_{17}\ OOC.CH \\ \\ \qquad\qquad\quad\ SO_3Na \end{array}$$

Di Octyl Sodium Sulphosuccinate

Surface-active compounds of this latter type are very effective wetting agents at low concentrations in neutral or mildly acid or alkaline solutions. They are decomposed by strong alkalies. Aside from their wetting properties, they can be used as emulsifiers and detergents. However, on a dry (100% active) basis, they are expensive.

In paper processing, the polycarboxylic acid ester sulphonates are employed in wetting new felts, moistening adhesive paper, and the manufacture of highly absorbent blotting paper and paper toweling. They also should be of some value in reworking "broke" and in working rag stock.

Fatty Amide Derivatives

In a further effort to block the carboxyl group in fatty acids, various amide surface-active compounds

were prepared. Typical formulas of products in this group are—

A) $CH_3(CH_2)_7CH{=}CH(CH_2)_7CONH.CH_2.CH_2.NH_2$ (31)
B) $CH_3(CH_2)_7CH{=}CH(CH_2)_7CONH.CH_2.CH_2OH$ (32)
C) $CH_3(CH_2)_7CH{=}CH(CH_2)_7CONH.CH_2.CH_2.NH_2.HCl$ (31)

C_2H_5
C_2H_5

D) $CH_3(CH_2)_7CH{=}CH(CH_2)_7CONH.CH_2.CH_2.N.HOOC.CH_3$ (31)
E) $(CH_2)_7CH{=}CH(CH_2)_7CONH.CH_2.CH_2OSO_2Na$ (33)
F) $CH_3(CH_2)_7CH{=}CH(CH_2)_7CON-CH_2.CH_2SO_3Na$ (34)

CH_3

The first two products are relatively insoluble in neutral or alkali solution but show surface-active properties in acids and in nonaqueous media such as oils, waxes, paints, coatings, etc.

Products C and D are stable in acid solutions only, where they are useful as foaming agents, wetting agents, penetrating agents, and dispersing agents. They are capable of bath-exhaustion under certain conditions. Their cationic effects will be discussed later.

Derivatives E and F are anionic agents, well balanced, being effective wetting agents, detergents, emulsifiers, deflocculating agents, and foaming agents. They are stable in acids, alkalies, and hard waters. Derivative E, because of its sulphate solubilizing linkage, is subject to hot alkali and concentrated alkali hydrolysis. These products as a group, while highly effective, are also somewhat expensive.

The anionic members of this group have been employed in the paper industry in most of the applications cited for the other anionic agents mentioned earlier. The cationic products are excellent as acid detergents in felt washing, although little has been done in this direction to date.

Alkyl Aryl Sulphonates

Aromatic hydrocarbons such as benzene, naphthalene, diphenyl, phenylphenol, etc., when treated with sulphuric acid produce water-soluble sulphonic acids having some surface activity. However, the molecule is not sufficiently balanced with regard to its hydrocarbon fragment to produce effective wetting or detergency. In short, the sulphonic acid salts are too soluble in water.

This defect is overcome by introducing aliphatic side chains before, during, or after sulphonation—thereby producing a series of surface-active agents of outstanding efficiency from a standpoint of both cost and performance. In fact, it is expected by many that these derivatives may rival soap on a cost-performance basis if their cost can be reduced a trifle further.

The alkyl aryl sulphonates may be described as adhering generally to the following schematic formula:

(35, 36, 37)

Fig. 2

The aromatic ring represented may be taken to be any aromatic ring and includes benzene, naphthalene, diphenyl, phenol, etc.

R is an aliphatic grouping of chain length ranging from C_1 to C_{18} and may be branched or substituted. Where the chain length is from C_1 to C_{11} the products are quite soluble in water and are effective wetting agents for use in acids, alkalies, and moderately hard waters. Their wetting efficiency is increased in salt, acid, or alkali solutions where their excessive solubility is reduced. Quite often, compounds of this type are poly-substituted with short-chain alkyl groups.

Where the length of the side chain ranges from C_{11} to C_{18} the products are less soluble in water and are outstanding detergents. They are effective in acids, alkalies, and hard waters. In highly concentrated electrolyte solutions they tend to salt out. The products as a group have been found to be excellent detergents for acid washing of felts, as dispersing agents for waxes and resins used in coatings, as latex stabilizers, as stabilizers for latex compounding ingredients, and as wetting agents in reworking broke and rag-pulping.

Cationic Surface-Active Agents

Cationic surface-active agents, as has been said earlier, ionize exactly the opposite to soap. The nonpolar hydrocarbon group migrates to the negative pole or cathode in an electrolytic cell.

A) $CH_3(CH_2)_7CH{=}CH(CH_2)_7COONa \rightleftarrows CH_3(CH_2)_7CH{=}CH(CH_2)_7COO^- + Na^+$

Soap ionization (nonpolar group anionic)

The nonpolar group is negatively charged, or anionic, migrating slowly to the anode or positive pole in an electrolytic cell.

B) $H_{33}C_{16}-N(CH_3)(CH_2.C_6H_5)-Cl \rightleftarrows \left[H_{33}C_{16}-N(CH_3)(CH_2.C_6H_5)(CH_3)\right]^+ + Cl^-$

Quaternary ammonium salt ionization (nonpolar group cationic)

The nonpolar group is positively charged, or cationic, being capable of migrating to the cathode or negative pole in an electrolytic cell.

Typical products of the cationic type are:

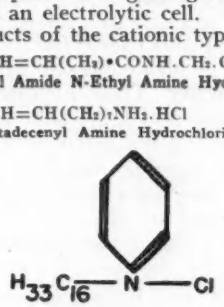
1. $CH_3(CH_2)_7CH{=}CH(CH_2)\cdot CONH.CH_2.CH_2.NH_2.HCl$
   Octadecenyl Amide N-Ethyl Amine Hydrochloride
2. $CH_3(CH_2)_7CH{=}CH(CH_2)_7NH_2.HCl$
   Octadecenyl Amine Hydrochloride
3. 

Fig. 3
Cetyl Pyridinium Chloride

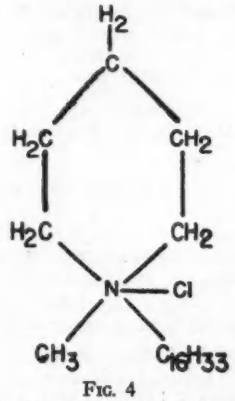
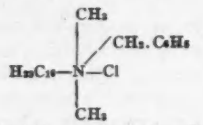
4. 

Fig. 4
Methyl Cetyl Piperidinium Chloride



Dimethyl, Cetyl Benzyl Ammonium Chloride

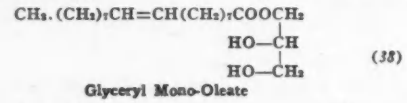
The cationic surface-active compounds are, because of their peculiar constitution, effective in acids and neutral solutions where they are effective wettings agents, detergents, deflocculents, and emulsifiers. They are also of value in preparing exhausting impregnant baths. They are stable in hard water.

A good many of the quaternary ammonium salts in this class are highly potent germicides and bactericides. Their strength ranges from 160 to 400 times that of phenol and they are nontoxic and noirritating at the concentrations used. This property should be of value in the paper industry where bacteria and fungus control are so important. As was said earlier, the products are valuable detergents in neutral or acid solution. They also have been found to have value in sizing with latex impregnants and as wetting agents for use with basic dyestuffs.

Nonionic Surface-Active Agents

Polyhydroxy Alcohol Esters

These are usually mono and di esters of glycerine, the glycols, pentaerythritol, and the various sugar alcohols, with fatty acids of varying chain length and unsaturation. A typical formula may be illustrated—



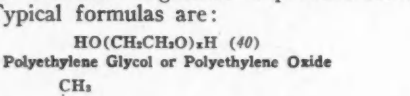
Glyceryl Mono-Oleate (38)

As neutral, salt-free products the polyhydroxy alcohol monoesters are poor surface-active agents. They are employed as cosmetic emulsifiers and in the preparation of quick-breaking agricultural spray emulsions. They are subject to alkali and acid hydrolysis but are stable in hard water. They are often used as defoamers in sulphite and kraft pulping *(39)* and for defoaming caesin coating compositions.

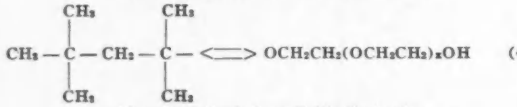
In order to increase efficiency, soap is usually incorporated with these esters, whereupon they become efficient emulsifiers for oils, fats, and waxes; but as a result suffer from the disadvantages already recited for soaps.

Ethylene Oxide and Polyhydroxyl Products

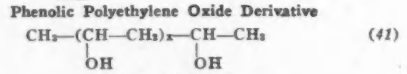
These surface-active compounds are stable in acids, alkalies, hard waters, oxidizing agents, etc. Their preparation is based on the theory that the repetition of many weakly polar groups produces an integral solubility of sufficient magnitude to produce surface activity. Typical formulas are:



Polyethylene Glycol or Polyethylene Oxide (40)



Phenolic Polyethylene Oxide Derivative (40)



Polyvinyl Alcohol (41)

Surface-active derivatives of this type are useful as wetting agents, dispersing agents, and deflocculents employable in acid, alkaline, and salt solutions. They can be used to prepare special sizes and coating compositions, particularly coatings that are stable to alum. Polyvinyl alcohol itself produces a lacquer-like film on paper when deposited from an aqueous solution. Such films are grease- and oil-resistant and may be made water-resistant on further treatment. Polyvinyl alcohol is also useful in increasing wet strength and as a filler adhesive in coatings.

The classes of surface-active compounds that have been discussed are merely typical and do not include all those that are commercially available. However, they are indicative of the products most widely used in modifying the surface properties of aqueous systems.

For fairly complete lists of the commercial surface-active compounds, the reviews of Beeler *(42)* and Van Antwerpen *(43)* will be found inclusive and accurate.

In conclusion, it is felt that the wider use of surface-active compounds in the paper industry will be realized through a better understanding of the advantages and limitations of each of the available types. Often the application of a surface-active compound to a paper processing problem has been decided against because the products tested were unsuited to the conditions peculiar to the operation involved. It is hoped that the outline which has been presented will be helpful in demonstrating the wide scope encompassed by the various surface-active compounds that are commercially available.

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High Strength Phenolic Paper Laminates*

By G. K. Dickerman[1]

Abstract

Because of a threatened shortage in light metals for structural purposes, impetus was given to the development of paper base laminates.

It was found that the character of the sheet was important so that certain specifications are required. By using proper modifications, paper base plastics can be formed by a variety of methods, the choice of which depends on the end use.

The specifications ordinarily applied to other structural materials have been applied to the paper base laminates and it is concluded that although they are deficient in certain respects such as impact resistance, they have other properties which are of sufficient value to cause their acceptance for many applications.

Prior to the last year or two the chief interest in the use of paper as a base for laminates in the plastics industry was restricted to electrical and decorative applications. Impregnated or coated with phenolic, urea, and more recently, melamine resins, paper-base laminates have long been familiar to all as electrical insulating panels and attractive, serviceable table tops. Although such applications added up to a substantial item in the laminating field, the total amount of paper consumed was not sufficient to be of very general interest to the paper industry as is indicated by the lack of references in the literature.

The use of paper base laminates as a structural material was handicapped almost to the point of nonexistence by high cost, the difficulty of manufacturing and fabricating, and perhaps of greatest importance, by disappointing strength values in relation to the specific gravity of the material. It is significant that for all commonly used structural materials from wood through to steel the ratios of tensile strength and elastic modulus to specific gravity approach constants. A glance at the strength properties listed for the commercial grades of paper base laminates a few years ago will indicate why design engineers gave them scant consideration.

In 1939 one of the aircraft companies which had engaged in a several years study of various laminating materials proposed that paper laminates of improved strength characteristics might find structural applications in aircraft *(1)*. The incentive for such a development lay not only in the threatened shortage of light metals but in the strong possibility of savings in cost, manpower, and weight in the fabrication of laminates as compared with metals. In order to make such applications practical it was necessary not only to produce laminates with improved physical characteristics but also to be able to use molding pressures much lower than had been the usual commercial practice in the past. The cost of dies and the availability of pressing equipment depended to a large extent on the required molding pressure.

The Forest Products Laboratory with the cooperation of the Consolidated Water Power and Paper Co. and other agencies, military and private, promptly undertook a fundamental investigation into pulps, papers, and resins. Their findings must remain largely unpublished until after the war but from this work emerged the commercial development of high strength Mitscherlich paper base laminates such as laminated Consoweld.

Properties of the Paper Base

Mitscherlich spruce sulphite has long been known as a pulp which develops rapidly with a minimum of mechanical treatment to produce a sheet of paper with exceptionally high tensile strength. This is the basic requirement for a high tensile laminate since the strength of the laminate derives chiefly from the strength of its filler stock.

Unfortunately all too little is known of the fundamental factors involved in making a strong sheet of paper. However in addition to the strengths of the individual fibers and the fiber to fiber bonds, orientation plays an important part. Greatest efficiency is obtained with a high ratio of machine direction strength to that across the machine and in a thin sheet with the fibers flat on the wire. The highest strengths in proportion to weight are not generally obtained on sheets heavier than 35 pounds ream weight.

To obtain a satisfactory resin impregnation in the treating operation the sheet must be unusually uniform in caliper and basis weight both with and across the machine and the degree of absorbency must be closely controlled.

The factors of the specific gravity and absorbency of the base sheet and the resin content and volatile content of the treated sheet are to a large extent interdependent. Bearing in mind that in the laminating or molding operation it is wished to saturate the voids with resin and at the same time maintain as high a ratio of fiber to resin as possible it can be seen that, especially for low molding pressures, a sheet of high specific gravity is necessary. This, of course, must be balanced against the absorbency required to obtain a thorough impregnation.

Experience has shown that a sulphite sheet of 0.65 specific gravity treated to a resin content of 35% will mold to a specific gravity of about 1.38 using a molding pressure of 250 pounds per square inch. The percentage of voids at 1.38 specific gravity is sufficiently low to give a good balance of physical properties but below 1.35 specific gravity, factors such as water absorption and compressive strength deteriorate.

The paper should preferably be impregnated on a treating machine of the dip and squeeze roll type. This allows the use of a varnish with a minimum of solvent and helps to drive the resin into the sheet. Precise control of resin content is obtained through adjustment of the squeeze roll nip.

Drying of the treated sheet involves a partial polymerization of the resin as well as removal of solvent. Since temperatures of over 275° F. for a period of about a minute are required to advance the resin to the desired stage it is evident that a long tunnel is necessary to maintain production on the comparatively light sheet. Best drying results are obtained through

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the use of graduated temperature zones, starting with a temperature of about 260°F. and working up.

The amount of volatile matter left in the treated sheet is determined by the desired resin flow at the specified molding pressure. The best properties are generally obtained by reducing the flow to a point just above that required to fill the voids. Excess flow not only detracts from the strength properties but results in a messy laminating operation.

Uniformity in physical properties is essential in any material to be used for structural purposes. It is a tribute to the versatility of wood that it has survived as the most widely used building material in spite of its variability. In producing synthetics of all kinds, one of the most effective methods of wiping out minor variations is through blending. This principle is put to good use in the preparation of treated paper for laminates by multiple sheeting. By cutting six or eight rolls at a time, thickness, and other properties are held to extremely close tolerances.

Laminating Process

Methods of laminating and forming have been covered extensively in the plastics literature and will only be mentioned briefly. Flat panels can best be laminated in multiple opening steam heated flat presses. The distribution of pressure must be uniform. Temperatures should be held close to 300° F. and the panels may be pulled hot.

Flat presses may also be used for molded shapes. Because of the low molding pressure requirements for this type of paper low cost dies such as cast Kirksite are satisfactory. However because of the limited amount of stretch in paper, the sheets must be tailored to produce compound curves of low radius. On production runs tailoring can be scientifically designed and economically done using steel rule dies on a flat bed or cylinder press.

On some types of jobs where it is impractical to design suitable dies, various bag molding or fluid pressure techniques can be used to advantage. The molding pressure requirement of the treated paper is an important factor in this type of work.

Post forming as it has developed in the aircraft industry provides another method which can be used to advantage on some shapes. The laminating is done in a flat sheet but the cycle is adjusted to leave the resin incompletely cured. At this stage it is thermoplastic and on reheating can be shaped to curved forms with very little pressure.

In all forming operations involving compound curves, paper is difficult to handle because of its lack of stretch. Some very difficult forms have however, been worked out and even where tailoring is involved, the use of paper is frequently justified by the low raw material cost and the strength and stiffness characteristics of the final product.

The types of structural uses fall into three general classes. Frequently as in the case of ammunition boxes, the most practical method is to glue together simple structural shapes such as flat pieces, angles and channels all of which can be readily formed on flat presses with simple dies. Most of the commonly used types of synthetic resin glues can be used satisfactorily providing the gluing surfaces are lightly sanded. Care must be used to ensure adequate glue line pressure because of the noncompressibility of the laminate but this is not ordinarily too difficult.

A second type of application is to mold the unit as a whole. Generally the shape and size of the piece and the length of the run will determine the molding method to be used.

A third application is in combination with other materials such as wood. Again molding pressure requirements are important since the paper can be laminated and bonded to the wood in one operation at pressures which will not crush the wood. In such applications the paper provides a hard, splinterproof surface and protects the wood against moisture absorption. As an example a floor of basswood faced on both sides with paper (Consoweld Sandwich Floor) has replaced a combination wood-metal floor in one of the large cargo planes.

Properties of Laminates

Having achieved commercial production of the high strength laminates the big job of evaluating its properties in comparison with other structural materials was begun. Because of the urgency of the task this work was shared with private laboratories by the Forest Products Laboratory, the Air Corps Materials Laboratory at Wright Field, the Aeronautical Materials Laboratories at the Naval Aircraft Factory and others. Although much remains to be done, a considerable amount of data has already been published *(2, 3, 5)*. Some is already obsolete because of improvement of the material.

Table I shows some of the more important properties. This data is based on hundreds of tests made on commercial production runs over the last year. The figures are conservative minimum values which may safely be used for design purposes. They are based on material molded under the standard conditions of 250 psi. molding pressure with a cycle for ⅛ inch thickness of 12 minutes at 315° F.

Figures 1 and 2 are typical stress-strain curves made on samples taken from commercial production.

Because of the anisotropic nature of paper, the question of distribution of strength values has been investigated. Some parallel laminated materials which show excellent strength in the grain direction are very weak across the grain and when such materials are cross laminated a decided weakness shows up on the bias or 45° direction.

TABLE II.—SPECIFIC (a) STRENGTH PROPERTIES

Material	Specific Gravity	Tension		Compression		Flexure	
		Ultimate	Elastic Modulus (× 10^6)	Ultimate	Elastic Modulus (× 10^6)	Modulus of Rupture	Elastic Modulus (× 10^6)
18-8 steel (b)	7.85	23,600	3.57	23,600	3.57	3,000	0.058
Al alloy (24S-T) (b)	2.8	23,200	3.68	23,200	3.68	8,300	0.469
Mg alloy (J-1h) (b)	1.8	25,000	3.61	25,000	3.61	13,900	1.12
Paper-base laminate Type I (c)	1.38	22,000	1.61	16,000	1.60	15,700	0.76
Paper-base laminate Type II (d)	1.38	29,000	2.39	16,000	2.39	21,000	1.14
Plywood (e)	0.56	14,000	2.04	.....	...	36,500	6.3

(a) See definitions.
(b) Based on values in ANC-5 Handbook, "Strength of Aircraft Elements."
(c) Cross laminated.
(d) Parallel laminated. Values are parallel to grain.
(e) Three ply 0.070 in. mahogany—poplar—mahogany. Values are parallel to face grain.

Table II gives a comparison of some basic strength properties of a high strength paper laminate, on a specific or common weight basis against a number of commonly used structural materials. The values were calculated according to the following definitions.

a) Specific ultimate tensile strength, compressive strength, and the specific elastic moduli in tension and compression are equal to the absolute value divided by the specific gravity of the material.

b) Specific modulus of rupture $= \frac{\text{modulus of rupture}}{(\text{specific gravity})^2}$

c) Specific elastic modulus in flexure $= \frac{\text{elastic modulus}}{(\text{specific gravity})^3}$

(Also referred to as "buckling stability.")

TABLE I.—ENGINEERING PROPERTIES OF A PAPER BASE LAMINATE

	Type I Cross Laminated	Type II Parallel Laminated
Specific Gravity	1.38	1.38
Tension		
Ultimate, p.s.i.	26,000	36,000
Elastic modulus, p.s.i.	2,300,000	3,000,000
Compression		
Ultimate, p.s.i.	18,000	19,000
Elastic modulus, p.s.i.	2,200,000	3,000,000
Flexure		
Modulus of rupture, p.s.i.	26,000	36,000
Elastic modulus, p.s.i.	2,000,000	3,000,000
Shear		
Edgewise, p.s.i.	14,000	15,000
Flatwise, p.s.i.	14,000	15,000
Bearing		
Edgewise, p.s.i.	30,000	30,000
Water Absorption		
⅛ in. x 2 in. x 2 in. (unsealed edges)	2-3½ %	
⅛ in. x 2 in. x 2 in. (sealed edges)	1-1½ %	
Gasoline and oil absorption	Not affected	

Notes—(1) The above values may be used for design. (2) All values except Bearing in accordance with Fed. Spec. L-P-406.

The values for the Consoweld laminates are based on averages of a large number of tests and are somewhat higher than the design values shown in Table I. It should be noted that in tension the ultimate strength of Type II is considerably above any of the metals and the bending and buckling characteristics of both types of laminates are much better than for the aluminum alloy. This is of particular interest to aircraft engineers. Further improvement in buckling stability beyond that of ordinary plywood may be obtained, where needed, through the use of extremely light weight core material in a sandwich construction *(4)*. Although work in this direction is still to a large extent experimental there is little question of the potentialities for the future.

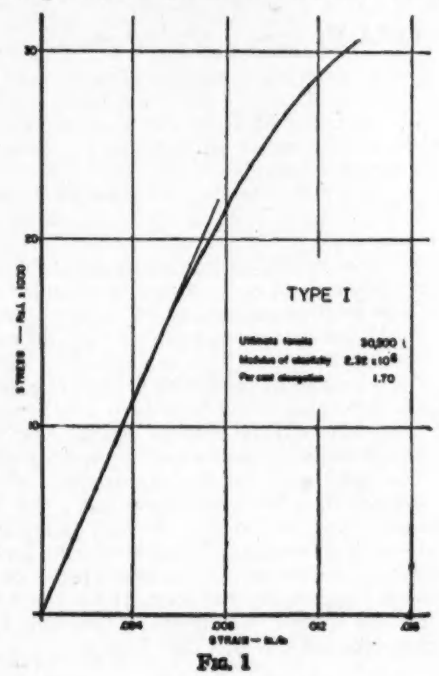

FIG. 1

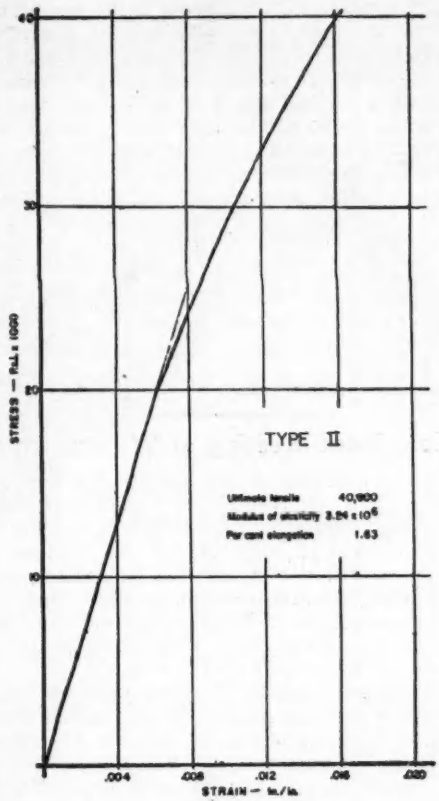

FIG. 2

Men accustomed to working with metal have criticized paper laminates for lack of ductility. The elongation before rupture is not comparable to a ductile metal and there seems to be no way of stretching the fibers or fiber bonds without losing desirable strength characteristics. Thus paper laminates, even though adequate in strength-weight ratios cannot generally be substituted for metals without some redesign. This is particularly true in the fastenings which in metal generally depend on ductility to a considerable extent to distribute stresses. That the problem is not too serious is evident when it is realized that wood, the most commonly used of all structural materials, is also one of least ductile.

Paper laminates are also criticized for brittleness. Although the high strength laminates are considerably tougher than the previous electrical grades, it is true that thin sheets are subject to fracture under a sharp impact. The resin is at least partly responsible for this and it is hoped that the resin manufacturers will assist in producing a product with better impact resistance. It is known, for example, that a laminate containing a high proportion of lignin is generally more resistant to impact than a straight phenolic laminate. At the present time when greater toughness is desired in thin sheets it can be obtained with a moderate sacrifice in strength and stiffness by laminating paper wtih resin impregnated fabric.

In conclusion it appears that in the recently developed high strength paper laminates a material made chiefly from paper is had which has sufficiently high

strength characteristics to place it in the field of common structural materials. Although the present field of applications is small it is increasing at a rate which should accelerate as wartime restrictions on the use of resins are relaxed and various industries become more familiar with the potentialities. The paper industry will do well to keep an eye on this development as a possible outlet for substantial quantities of paper and possibly other products of pulp manufacture.

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2. Fuller, Major F. B., Engineering properties of plastics, *Modern Plastics* (June, 1943).
3. Field, P. M., Basic physical properties of laminates, *Modern Plastics* (August, 1943).
4. Gordon, H. R., Aircraft design considerations, *Modern Plastics* (September, 1943).
5. Sang, Henry, and Field, P. M., Evaluation of high strength plastics, *Modern Plastics* (October, 1943).

Hold Joint Meeting at Watertown

The joint meeting of the Empire State Section of TAPPI and the New York Canadian Division of the Superintendents Association was held Friday and Saturday, June 23 and 24, 1944 at the Hotel Woodruff, Watertown, N. Y. Friday morning was devoted to registration at which time over 100 representatives of paper companies and supplying industries signed in. Many of those attending were accompanied by their wives.

The technical meeting Friday afternoon was of considerable interest and was well attended.

E. A. Poirier briefly described his system for the automatic control of the vacuum on suction boxes in which a steady vacuum is applied which varies according to the condition of the stock.

Vance Edwardes gave a resume of his talk given at the Springfield meeting on the future of the sulphite pulping industry. He stressed that the sulphite industry must give more consideration to the problem of waste disposal.

George H. McGregor, well supported by statistics, showed that the future of pulp and papermaking depended on a more realistic approach to the conservation and use of our forest reserves.

F. E. Carlson, president of the New York Section of the Society of American Foresters, in a talk Friday evening after the dinner, stated that a larger portion of the land in New York State which is of value only as forest land, is growing scrub species and that other sections involving considerable forests cannot now be commercially exploited. A recognized plan of forest management is needed for all the forest resources of the state if they are to maintain the consuming industries and the paper industry was invited to participate.

John Cornell of the Paper Mill News spoke at the meeting Saturday morning on the trends of the future. His was a thought provoking presentation which was followed by an active discussion.

The social side of the meeting was enjoyed by those who attended the dinner dances Friday and Saturday nights and who devoted Saturday afternoon to bridge or golf.

Those who registered for the meeting are as follows:

E. A. Poirier, Mr. and Mrs. F. J. McCourt, Mr. and Mrs. P. D. Switzer, K. V. Carmer, Frank R. Holmsen, R. M. Drummond, R. T. Bingham, R. G. Macdonald, Mr. and Mrs. V. P. Edwardes, Mr. and Mrs. Frank J. Lang, Ralph E. Davis, Mr. and Mrs. P. D. Bradley, Ethel Bradley, H. H. Fish, Grey Fish, F. A. Soderberg, B. H. Treadwell, Mr. and Mrs. John Treadwell, A. B. Leachy, A. G. Frankenhoff, Mr. and Mrs. Wm. E. Wanstall, F. O. Sundstrom, G. E. Osterheldt, Darwin Miscall, Mr. and Mrs. Harold Remington, Mr. and Mrs. F. F. Dority, John Cornell, E. P. McGinn, Edmond Flynn, Mr. and Mrs. Homer M. Rice, Ivar Ekholm, Mr. and Mrs. Murray Bennett, Walter Couture, Ann Palmer, Charles Horton, Peter Wright, Thomas Lynch, Mr. and Mrs. D. K. Pattilloch, John Rich, William Leeson, Foster Doane, Jr., Ernest C. Waters, C. D. Townsend, M. J. Sullivan, Mr. and Mrs. W. J. O'Brien, Mr. and Mrs. Fred Goodwill, Isle Wisner, E. P. Townsley, Mr. and Mrs. Noel Phillips, Chris Crusius, Mr. and Mrs. W. R. Benson, Jos. A. Lunn, Geo. Duers, F. W. O'Neil, C. E. Libby, Charles Slack, E. S. Shanley, Geo. McGregor, C. Ives Gehring, John Mackie, William Flohr, P. C. Mather, Mr. and Mrs. Ernest Loyst, J. Allen, Mr. and Mrs. Tex Richards, Geo. Pennock, H. A. Spencer, H. S. Lewis, Mr. and Mrs. Henry Perry, Mr. and Mrs. Henry Plantz, Henry Mellen, R. J. Nichols, Corwin Jewell, George Fromm, Joseph Leek, G. H. Tomlinson, Thomas Stafford, A. E. H. Fair, Mr. and Mrs. Larry Sherman, Wilfred Arsenault, Ray Green, Mr. and Mrs. H. R. Wheeler, Mr. and Mrs. M. H. Myers, William T. Murphy, William K. Murphy, Wallace Buck, Mr. and Mrs. James LaPierre, Mr. and Mrs. John Janstrom, W. Weston, Mr. and Mrs. R. C. Shearer, Albert Carroll, M. W. Heddon, J. R. Stebbins, W. S. Gamble, A. G. Horr, F. M. Williams, J. J. Brown, Al Julin, R. P. Tobin, Martin Jaffe, Merlin Newcomb, Mr. and Mrs. H. W. Duggan, Mr. and Mrs. Way Clark, F. E. Carlson, H. D. Coox, Herb Karberg, H. R. Wheeler, Jr., H. M. Gray, H. A. Horstmann, Mr. and Mrs. R. J. Schadt, Mr. and Mrs. E. F. McIntyre, George Schell, John D. Kane, E. J. Johnston, Mr. and Mrs. Edward Marshall, Mr. and Mrs. Edward Tucker.

OPA Freezes Logging Prices

Maximum prices for contract logging services performed in the western half of the United States were frozen by the Office of Price Administration at the price paid by the buyer on January 11, 1944, the effective day of the regulation covering such services. The freeze order became effective June 24, 1944.

In effect the freeze price at current levels in most of the area covered, will enable buyers of contract logging services to pay the maximum prices that they have been paying and operate profitably under their existing and product ceilings, OPA said.

Previously, the maximum price was the difference between stumpage cost and an established log ceiling.

These new pricing methods may be used only where no specific maximum prices have been established on any of the products of the contract logging service, or if the service is to be performed in an area where dollars-and-cents prices for the logs, or other primary forest products have not been established, OPA said.

Their use is confined to the area west of the 100th meridian—a line running through North Dakota, South Dakota, Nebraska, Kansas and Texas—except for western Washington and western Oregon where log prices are covered by Revised Maximum Price Regulation No. 161 (West Coast Logs).

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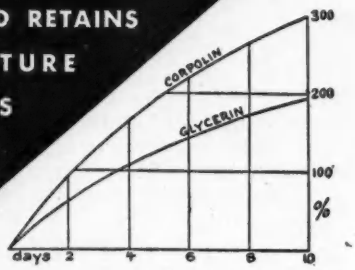

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*Patent Pending. Name Reg. U. S. Pat. Off.

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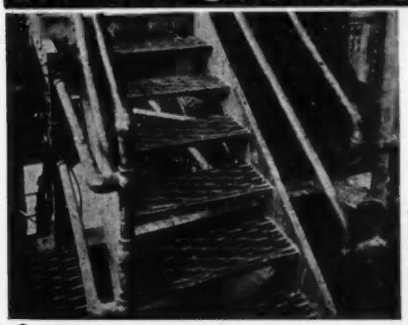

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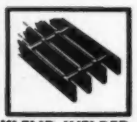

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New York Paper and Pulp Market Review

Paper Demand and Production Continue High—Mill Receipts of Pulpwood In May Rise 27 Percent Above April With Northeast the Critical Area — More Waste Paper Is Required — Other News.

Office of the PAPER TRADE JOURNAL.
Wednesday, June 28, 1944.

Demand continues so large in relation to supply that it is difficult to provide an equitable distribution of paper and paper products. Consumers, however, have a reasonably good supply. The excellent record which the paper industry has made in this war economy, is due to its high productive capacity, its desire to closely cooperate with all to produce all the paper possible, and to efforts of distributors to deliver paper items where required. In its June 25 report, the WPB points out that paper mill operations were sustained at a rate far in excess of that justified by raw material input in 1942 and 1943.

Most current reports received from manufacturers' representatives, jobbers, and general paper merchants, reflect the difficulties of transacting business today, and in view of the very favorable reports along the fighting fronts, most opinion is more optimistic of the future. Conditions in the final quarter of the year should be substantially better, appears to be the concensus of current comment on the future.

Paper production for the week ended June 17 was estimated at 92.8%, compared with 87.0% for 1943, with 86.5% for 1942, with 99.9% for 1941, and with 93.1% for the corresponding week for 1940.

Paper board production for the week ended June 17 was 95.0%, compared with 95.0% for 1943, with 69.0% for 1942, with 88.0% for 1941, and with 79.0% for the corresponding week for 1940.

Newspaper publishers, through their special committee meeting last week, recommended that the WPB request Canada to restore its commitment of 200,000 tons of 32-pound newsprint per month in the third quarter, rather than continue the mixed-weight basis with a monthly sacrifice of at least 10,000 tons.

Extra light newsprint, as light as 25 pounds, 24 by 36, is permitted to be sold by producers at a higher price than lightweight newsprint. The OPA price set on lightweight newsprint is $4 per ton above the standard 32-pound print paper. Any manufacturer who sold extra lightweight newsprint in the base period, October 1, 1941, through March 31, 1942, may add to his ceiling price for 32-pound newsprint, the differential he has used. If no differential was in effect, apply to the OPA, Washington, D. C., for a differential.

Wood Pulp

Pulpwood receipts in May, including imports, totaled 1,284,000 cords, which was 27% higher than in April, 1943, and 7% less than in May, 1942, the WPB reports. Mill receipts of domestic wood in May were 31% higher than in May, 1943 (a low month) and aggragated 216,000 cords. The pulpwood situation in the Northeast continues critical, the report states, although May receipts of wood in this area were about 11,000 cords higher than in April of this year.

Rags

Demand for new cotton cuttings is active. Mill buying is at ceiling prices on all grades. Prices are strong.

Old cotton rag demand is active. Mills continue to buy in volume and the demand for the roofing grades is in excess of supply. Prices are strong.

Old Rope and Bagging

Demand for all grades of old rope is heavy and continues to absorb all available supplies to meet large war uses. All fibers are in strong demand. Prices are firm.

No improvement in bagging has been reported this week. Trading in scrap bagging is at a very low level and manufacturers' inventories are reported relatively high. Prices are soft and continue nominal.

Old Waste Paper

Demand for old waste paper continues active, with the supply situation serious, despite the recent improved collections of paper stock. The latest report states that waste paper stock is being collected and distributed to the mills at a figure within 10% of requirements. Production requirements of 4,440,000 tons of fiber containers for this year, is an increase of 8% over 1943. To keep mills on a good production schedule, the WPB points out, waste paper must flow to the mills at the rate of more than 600,000 tons monthly.

Twine

All grades of twine continue in good demand. No important change in the supply situation, or in prices, has been reported during the current week.

MARATHON PLANS NEW FINANCING

(Continued from page 7)

paper mills, showing a recent drop of 6,000 tons over the previous week, according to Paul W. Romig, district manager of WPB, Green Bay, Wis., who declared that a serious shortage exists.

Waste paper will be collected by the Appleton, Wis. paper dealers on Thursday, July 13, in conjunction with the Appleton Plan for the Recovery of Waste Paper. Proceeds from the sale of paper at $6 a ton will be divided equally between Appleton Boy Scouts and Girl Scouts.

Foremen Attend Safety Meeting

The sixth of a series of monthly meetings for foremen and supervisors in industry, sponsored by the Twin City Safety Council, was held Wednesday evening, June 21, at Hotel Menasha. Menasha, Wis. It was the final meeting of the series. Among the firms represented were Kimberly-Clark Corporation, Neenah Paper Company, Wisconsin Tissue Mills, Marathon Paper Mills, Whiting Paper Company, George Banta Publishing Company and Bergstrom Paper Company.

THE RETURN OF COMPETITION

After the war competition in industry will be keener than ever before. Many millions of people who have been mobilized for war will be turned back into normal pursuits. New industries, new processes and new markets will dominate the economic picture.

The manufacturer who can meet his competitors' cost will be the one to survive. The low cost industries will be the ones to profit.

In this connection, remember that—

During the depression years of the early and middle thirties, industry expanded at a greater rate in the Seaboard Southeast than anywhere else in the Country.

The reason—

Operating factors are favorable and hence manufacturing costs are low.

When you plan on plant expansion, let us submit facts and figures on locations in the Seaboard Southeast. The inquiry will cost you nothing. It may be worth a lot to you.

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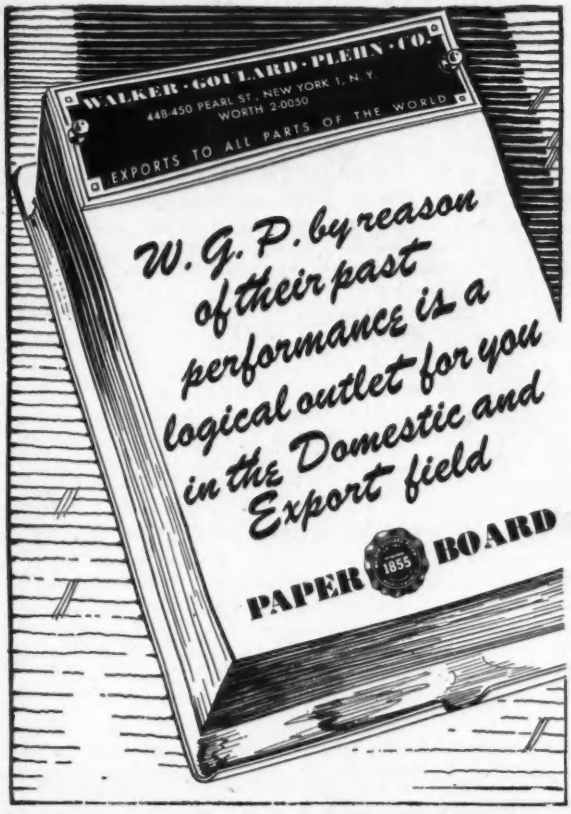
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MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL.
Wednesday, June 28, 1944.

BLANC FIXE—Prices on blanc fixe continue to conform to prevailing quotations. Demand is reported fair. The pulp is quoted at $40 per ton, in barrels, at works. The powder is quoted at $60 per ton, f.o.b. works.

BLEACHING POWDER—Demand is reported heavier. Production is heavy and the balance between supply and demand is reported satisfactory. Quotations are unchanged. Bleaching powder is currently quoted at from $2.50 to $3.10 per 100 pounds. All prices in drums, car lots, f.o.b. works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10,000 pounds or more, 24 cents per pound; 2,000 pounds, 24¼ cents per pound; less than 2,000 pounds, 24¾ cents per pound f.o.b. shipping point.

CAUSTIC SODA—Demand heavy. Deliveries are improved. Market tight. Prices unchanged. Solid and flake scarce. Solid caustic soda is currently quoted at $2.30 per 100 pounds. The flake and ground are currently quoted at $2.70 per 100 pounds. All prices in drums, car lots, f.o.b. works.

CHINA CLAY—Current demand is reported moderate on many grades of china clay. Quotations unchanged. Domestic filler clay is quoted at from $7.50 to $15 per ton; coating clay is quoted at from $12 to $22 per ton, at mines. Imported china clay is currently quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Demand heavier with market reported definitely tight at this date. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b. works.

ROSIN—The rosin market reports higher prices on some grades this week. "G" gum rosin is currently quoted at $5.64 per 100 pounds, in barrels, at Savannah. "FF" rosin is currently quoted at $5.64 per 100 pounds, in barrels, at New York. Seventy per cent gum rosin size is currently quoted at $5.91 per 100 pounds, f.o.b. works.

SALT CAKE—Prices on salt cake continue to be reported unchanged. Demand relatively low during the current week. Domestic salt cake is currently quoted at $15 per ton, in bulk. Chrome cake is currently quoted at $16 per ton. All quoted prices in car lots, f.o.b. shipping point.

SODA ASH—Heavy demand for soda ash is reported in excess of current production. Market tight. Prices continue to conform to prevailing levels. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Corn available for trade consumption is reported a little larger at this date. Demand continues very heavy and greatly in excess of available supplies. Prices unchanged on starch. Pearl is quoted at $3.72 per 100 pounds. Powdered starch is quoted at $3.83 per 100 pounds. All prices in bags, car lots f.o.b. Chicago.

SULPHATE OF ALUMINA—Demand good. Supply situation is reported satisfactory for the week. Prices of the commercial grades are currently quoted at from $1.15 to $1.25 per 100 pounds. The iron free is currently quoted at $2.35 per 100 pounds. All prices in bags, car lots, f.o.b. works.

SULPHUR—Current consumption of sulphur continues heavy. Market situation unchanged. The quotation on annual contracts continues at $16 per long ton, f.o.b. mines. The current price on contracts at Gulf Ports is $17.50 per long ton.

TALC—Demand reported moderate. Domestic grades are currently quoted at from $16 to $21 per ton at works.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the current maximum prices.

Paper

(Delivered New York)

Standard News, per ton—

Roll, contract...	*$58.00	@	—
Sheets	66.00		—

* OPA Maximum Price.

Kraft—per cwt.—Carload Quantities Zone A, f.o.b. Mill

Superstandard Wrapping	*$5.25	@	—
No. 1 Wrapping...	*5.00	"	—
Standard Wrapping	*4.75	"	—
Standard Bag.....	*4.375	"	—

* OPA Manufacturers' Prices.

Tissues—Per Ream—Carlots

White No. 1.....	1.12½	"	—
White No. 1 M. G.	1.10	"	—
White No. 1½....	1.00	"	—
White No. 2.....	.90	"	—
Anti-Tarnish M.F..	1.20	"	—
Colored	—	"	—
Kraft	.95	"	—
Manila	.90	"	—

Toilet—1 M. Sheets—Per Case

Unbleached	4.25	"	—
Bleached	5.70	"	—
Unbl. Toilet, 1 M.	4.16	"	—
Bleached Toilet...	5.70	"	—

Paper Towels, Per Case—

Unbleached, Jr.....	2.20	"	—
Bleached, Jr.....	3.20	"	—

Manila—per cwt.—C. l. f. a.

No. 1 Jute.....11.25		@	—
No. 1 Manila Wrapping, 35 lb.....	6.00	"	6.25
No. 2 Manila Wrapping, 35 lb.....	5.75	"	6.00

Boards, per ton—

News	*48.00	@	—
Chip	*48.00	"	—
Sgl. Mla. Ll. Chip	*60.00	"	—
White Pat. Coated	*75.00	"	—
Kraft Liners 50 lb.	*63.00	"	—
Binders Boards....	84.00	"	116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	32.20 " 37.75	33.35 " 39.25
85% Rag	.... "	29.90 " 35.00
75% Rag	23.00 " 27.00	24.15 " 28.25
65% Rag	.... "	22.80 " 27.75
50% Rag	18.70 " 22.75	19.90 " 24.25
25% Rag	16.40 " 20.00	17.55 " 21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds	Ledgers
No. 1..	$10.55@$12.75	$11.70@$14.25
No. 2..	9.65 " 11.75	10.80 " 13.25
No. 3..	9.20 " 11.25	10.35 " 12.50
No. 4..	8.90 " 10.75	10.05 " 12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated...	$13.65	@	$15.50
No. 2 Glossy Coated...	12.40	"	14.00
No. 3 Glossy Coated...	11.60	"	13.25
No. 4 Glossy Coated...	11.15	"	12.75
No. 1 Antique (watermarked)	10.25	"	11.75
No. 2 Offset.....	9.60	"	11.00
A Grade E. F.....	9.35	"	10.75
A Grade S. & S. C....	9.60	"	11.00
B Grade E. F.....	8.85	"	10.25
B Grade S. & S. C....	9.10	"	10.50
C Grade E. F.....	8.55	"	9.75
C Grade S. & S. C....	8.80	"	10.00
D Grade E. F.....	8.25	"	9.50
D Grade S. & S. C....	8.50	"	9.75

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight Not Exceeding OPA Allowances.

Bl. Softwood Sulphite.....	$86.00
Unbl. Softwood Sulphite.....	74.00
Bl. Hardwood Sulphite.....	83.50
Unbl. Hardwood Sulphite.....	71.50
Bl. Mitscherlich.....	81.00
Unbl. Mitscherlich 72.00 @	82.00
N. Bleached Sulphate.....	86.00
S. Bleached Sulphate.....	79.00
N. Semi-Bleached Sulphate...	82.00
S. Semi-Bleached Sulphate....	75.00
N. Unbl. Sulphate.....	73.00
S. Unbl. Sulphate.....	63.50
Bl. Soda	72.00
Unbl. Soda	68.00
Groundwood	50.00

Transportation Allowances

Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area).....	10.50
West Coast (out area).....	16.50

	50%-80% Air Dry Weight
Northeast	$11.50
Lake Central	11.50
Southern	14.00
West Coast (in area).....	9.50
West Coast (out area).....	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area).....	7.50
West Coast (out area).....	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings— New White, No. 1..	6.50	@	7.25*
Silesias No. 1.....	—	"	5.75*
New Unbleached...	6.75	"	7.50*
Blue Overall.....	—	"	5.50*
Fancy	—	"	3.50*
Washables	—	"	3.00*
Bleached Khaki Cuttings	—	"	4.25*
Unbleached Khaki Cuttings	—	"	3.50*

* OPA Maximum Prices.

SCREENS
of Perforated Metal

The Harrington & King Perforating Co.

5652 Fillmore St., Chicago 44, Ill. 114 Liberty St., New York 6, N. Y

MISCO "C"
THE CORROSION RESISTANT ALLOY
CAST • ROLLED • FABRICATED
for all equipment exposed to corrosion by sulphite acids
MICHIGAN STEEL CASTING CO., DETROIT 7, MICH.

INDUSTRIAL TYCOL OILS-GREASES
A COMPLETE LINE
OF TYCOL LUBRICANTS SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE
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Eastern Division
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Advanced Constructions, Developed By The Pioneers in the Industry
COVEL-HANCHETT CO., Big Rapids, Mich., U. S. A.

FOR 40 YEARS REDUCING STEAM COSTS IN PAPER MILLS
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STEAM SPECIALTIES COMPANY
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FRICTION CLUTCHES
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PAPER MILL MACHINERY

Appleton Wires are Good wires
APPLETON WIRE WORKS, INC. APPLETON, WIS.

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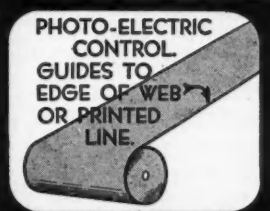
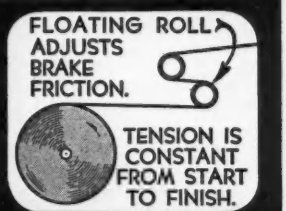
AMORPHOUS WAXES
Melting Points 120° F. to 205° F.
For the Manufacture of
LAMINATING PAPER . . GLASSINES . . WATER-PROOFING . . GREASE PROOFING . . EXTENDERS FOR PARAFFIN, FOOD CONTAINERS, CONTAINER LININGS, ADHESIVENESS AND PROTECTIVE COATING.

WEB TENSION ALSO
WEB SIDE-GUIDING CONTROLS
for slitters, winders, web presses.





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PAPER CONVERTING MACHINES
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Paper Bag Machines, Aniline & Oil-Ink Presses, Waxing, Gluing, Varnishing, Laminating Machines.
POTDEVIN MACHINE CO.
EST. 1893
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POTDEVIN

Old Rags

White, No. 1—
Repacked .....*3.80 " —
Miscellaneous ....*3.20 " —
White, No. 2—
Repacked .....*2.90 " —
Miscellaneous ....*2.65 " —
Third and Blues—
Repacked .....*2.20 " —
Miscellaneous ....*1.80 " —
Roofing Rags—
No. 1.....*1.55 " —
No. 2.....*1.45 " —
No. 3 (bagging)..*1.35 " —
No. 4.....*1.35 " —
No. 5A.....*1.35 " —
Old Manila Rope.. 5.75 " —
*OPA Maximum Prices.

Foreign Rags

All Prices nominal

New Rags

New Dark Cuttings.. 2.25 @ 2.40
New Mixed Cuttings. 2.00 " 2.20
New Light Silesias.. 5.50 " 5.75
Light Flannelettes... 5.50 " 5.75
New White Cuttings. 7.00 " 7.50
New Light Oxfords. 4.00 " 4.50
New Light Prints... 3.00 " 3.25

Old Rags

No. 1 White Linens. 7.50 " 8.50
No. 2 White Linens. 6.50 " 7.50
No. 3 White Linens. 4.50 " —
No. 4 White Linens. 2.25 " 2.25
No. 1 White Cotton. 4.25 " 4.75
No. 2 White Cotton. 3.25 " 3.75
No. 3 White Cotton. 2.50 " 3.00
No. 4 White Cotton. 1.90 " 2.20
Extra Light Prints.. 2.00 " 2.40
Ord. Light Prints... 1.75 " 2.15
Med. Light Prints... 1.55 " 1.95
Dutch Blue Cottons. 2.25 " 2.50
French Blue Linens. 3.00 " —
Checks and Blues... 2.00 " —
Linsey Garments.... 1.90 " 2.00
Dark Cottons..... 1.50 " 1.60
Old Shopperies..... 1.30 " 1.45
New Shopperies..... 1.45 " 1.50
French Blues..... 2.25 " 2.50

BAGGING

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—
Foreign .....Nominal
Domestic ..... 4.25 @ 4.35
Wool Tares, light.... 4.25 " 4.50
Wool Tares heavy... 4.50 " 5.00
Bright Bagging..... 4.50 " 4.85
Manila Rope—
Foreign ..... — " —
Domestic .....*5.75 " —
Jute Threads..... 5.50 " —
No. 1 Sisal Strings..*4.00 " —
Mixed Strings..... 2.00 " —
*OPA Maximum Price.

Old Waste Papers

(F. o. b. New York)
OPA Maximum Prices

No. 1 Hard White Envelope Cuts, one cut ..... 3.37½ @ —
No. 1 Hard White Envelope Cuts.... 3.12½" —
No. 1 Hard White Shavings, unruled. 2.87½" —
No. 1 Hard White Shavings, ruled... 2.50 " —
Soft White Shavings, one cut..... 2.87½" —
No. 1 Soft White Shavings ..... 2.50 " —
Soft White Shavings, Misc. ..... 2.15 " —
No. 1 Fly Leaf Shavings ..... 1.67½" —
No. 2 Fly Leaf Shavings ..... 1.12½" —
No. 1 Groundwood Fly Leaf Shavings 1.25 " —
No. 2 Mixed Groundwood Fly Leaf Shavings ..... .90 " —
Mixed Colored Shavings ..... .75 " —
Mixed Groundwood Colored Shavings.. .90 " —
Overissue Magazines ..... 1.67½" —
No. 1 Heavy Books & Magazines..... 1.67½" —
Mixed Books..... .85 " —
No. 1 White Ledger 2.17½" —
No. 2 Mixed Ledger, colored ..... 1.87½" —
New Manila Envelope Cuttings, one cut.. 2.87½" —
New Manila Envelope Cuttings ..... 2.65 " —
Extra Manilas..... 1.85 " —
Mixed Kraft, Env. & Bag Cuttings..... 2.75 " —
Kraft Envelope Cuttings ..... 3.25 " —
Triple Sorted, No. 1 Brown Soft Kraft. 2.50 " —
New 100% Kraft Corrugated Cuttings.. 2.25 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
New Jute Corrugated Cuttings ..... .90 " —
Old 100% Kraft Corrugated Containers 1.75 " —
Old Corrugated Containers ..... 1.15 " —
Box Board Cuttings. .72½" —
White Blank News.. 1.65 " —
Overissue News..... .85 " —
No. 1 News..... .75 " —
No. 1 Mixed Paper. .70 " —
Old Corrugated Containers ..... .82½" —
Mill Wrappers..... .85 " —

Twines

All Prices Nominal
(F. o. b. Mill)
(Soft Fiber)

Coarse Polished—
India ..... .21 @ —
White Hemp..... .21 " —
Fine Polished—
Fine India..... .26 " —
Unpolished—
Box ..... .17½" —
Paper Makers..... .17 " —
Tube Rope..... 19 " —
Wall Paper..... .20½" —
Wrapping ..... .23 " —
Soft Fiber Rope... .19 " —
Cotton ..... .25 " —
(Hard Fiber)
Medium Java..... .18 " —
Mex. Sisal..... .16 " —
Manila ..... " —

PHILADELPHIA

Domestic Rags (New)

(Price to Mill.)

Shirt Cuttings—
New White No. 1..... .07¼
New White No. 2..... .05¾
Light Silesias..... .05¾
Black Silesias, soft..... .03¾
New Unbleached ..... .07½
Washable Prints ..... .04¼
Washable No. 1..... .03
Blue Overall..... .05½
Cottons—According to grades—
Washable shredding ..... .01¾
Fancy Percales ..... .04¾
New Black Soft ..... .03¼
Khaki Cuttings—
Unbleachable Cotton Cuttings .03½
Bleachable Cotton Cuttings.. .04¼
Men's Corduroy ..... .03½
Ladies' Corduroy ..... .03
Cottonades ..... .03¼

Domestic Rags (Old)

White No. 1—Repacked ..... 3.80 " —
Miscellaneous No. 1. 3.20 " —
Miscellaneous No. 2. 2.65 " —
White No. 2—Repacked ..... 2.90 " —
Thirds and Blues—
Miscellaneous .... 1.80 " —
Repacked ..... 2.20 " —
Black Stockings—
(Export) .....Nominal
Roofing Stock—
Foreign No. 1....Nominal
Domestic No. 1... 1.55 " —
Domestic No. 2... 1.45 " —
Roofing Bagging.. 1.35 " —
Old Manila Rope... 5.75 " —

Bagging

(F. o. b. Phila.)

Gunny No. 1—
Foreign .....Nominal
Domestic ..... 3.00 " 3.50
No. 1 Clean bright—
Sisal Strings ..... .04
No. 2 Clean bright—
Sisal Strings ..... .03
Sisal Jute ..... .02½ " .02¾
Scrap—
No. 1..... 3.25 " 3.50
No. 2..... 1.75 " 1.80
Wool Tares ho ... 4.00 " 4.25
No. 1 New Light Burlap ..... 3.00 " 4.00
New Burlap Cuttings 3.75 " 4.00

Old Papers

(F. o. b. Phila)
OPA Maximum Prices

No. 1 Hard White Envelope Cuts, one cut ..... 3.37½" —
No. 1 Hard White Shavings, unruled.. 2.87½" —
Soft White Shavings, one cut..... 2.50 " —
White Blank News.. 1.65 " —
Soft White Shavings. Misc. ..... 2.15 " —
No. 1 Fly Leaf Shavings ..... 1.67½" —
No. 2 Fly Leaf Shavings ..... 1.12½" —
No. 1 Groundwood Fly Leaf Shavings 1.25 " —
No. 2 Groundwood Fly Leaf Shavings .90 " —
Mixed Colored Shavings ..... .75 " —
New Manila Envelope Cuts, one cut..... 2.87½" —
Hard White Envelope Cuts, one cut..... 3.37½" —
Triple Sorted No. 1 Brown Soft Kraft. 2.50 " —
Mixed Kraft Env. & Bag Cuttings..... 2.75 " —
Kraft Envelope Cuttings ..... 3.25 " —
No. 1 Heavy Books & Magazines..... 1.67½" —
New Manila Envelope Cuts, one cut..... 2.87½" —
New Manila Envelope Cuttings ..... 2.65 " —
White and Colored Tabulating Cards.. 2.25 " —
Ground Wood Tabulating Cards ..... 1.35 " —
White Blank News.. 1.65 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
No. 1 Mixed Paper .70 " —
Overissue News..... .85 " —
Box Board Cuttings. .72½" —
New Corrugated Cuttings, Kraft..... 2.25 " —
Old 100% Kraft Corrugated Containers 1.75 " —
Old Corrugated Containers ..... 1.15 " —
Jute Corrugated Cuttings ..... 1.07½" —

Bagging

(F. o. b. Boston)

Gunny Bagging—
Foreign .....(nominal)
Domestic ..... — @ 2.75
Sisal Rope No. 1....*4.75 " —
Sisal Rope No. 2....*4.25 " —
Mixed Rope ..... — " 1.55
Transmission Rope—
Foreign .....(nominal)
Domestic ..... 2.75 " 3.00
Manila Rope—
Foreign .....(nominal)
Domestic ..... 5.75 " —
Soft Jute Rope..... 5.25 " —
Jute Car Threads. 3.00 " 3.50
Bleachery Burlap.... 8.50 " 9.00
Scrap Burlap—
Foreign .....(nominal)
Domestic ..... — " 2.50
South American ... — " 3.00

BOSTON

Old Papers

(F. o. b. Boston)
OPA Maximum Prices

No. 1 Hard White Shavings, unruled. 2.87½ @ —
No. 1 Hard White Shavings, ruled... 2.50 " —
Soft White Shavings, Misc. ..... 2.15 " —
No. 1 Fly Leaf Shavings ..... 1.67½" —
No. 2 Fly Leaf Shavings ..... 1.12½" —
No. 1 Groundwood Fly Leaf Shavings 1.25 " —
No. 2 Groundwood Fly Leaf Shavings .90 " —
Mixed Colored Shavings ..... .75 " —
New Manila Envelope Cuts, one cut..... 2.87½" —
Hard White Envelope Cuts, one cut..... 3.37½" —
Triple Sorted No. 1 Brown Soft Kraft. 2.50 " —
Mixed Kraft Env. & Bag Cuttings..... 2.75 " —
Kraft Envelope Cuttings ..... 3.25 " —
No. 1 Heavy Books & Magazines..... 1.67½" —
New Manila Envelope Cuts, one cut..... 2.87½" —
New Manila Envelope Cuttings ..... 2.65 " —
White and Colored Tabulating Cards.. 2.25 " —
Ground Wood Tabulating Cards ..... 1.35 " —
White Blank News.. 1.65 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
No. 1 Mixed Paper .70 " —
Overissue News..... .85 " —
Box Board Cuttings. .72½" —
New Corrugated Cuttings, Kraft..... 2.25 " —
Old 100% Kraft Corrugated Containers 1.75 " —
Old Corrugated Containers ..... 1.15 " —
Jute Corrugated Cuttings ..... 1.07½" —

Bagging

(F. o. b. Boston)

Gunny Bagging—
Foreign .....(nominal)
Domestic ..... — @ 2.75
Sisal Rope No. 1....*4.75 " —
Sisal Rope No. 2....*4.25 " —
Mixed Rope ..... — " 1.55
Transmission Rope—
Foreign .....(nominal)
Domestic ..... 2.75 " 3.00
Manila Rope—
Foreign .....(nominal)
Domestic ..... 5.75 " —
Soft Jute Rope..... 5.25 " —
Jute Car Threads. 3.00 " 3.50
Bleachery Burlap.... 8.50 " 9.00
Scrap Burlap—
Foreign .....(nominal)
Domestic ..... — " 2.50
South American ... — " 3.00
Wool Tares—
Foreign .....(nominal)
Domestic 4.25
Aust. Wool Pouches.. — " 3.25
New Zealand Wool Pouches ..... — " 3.50
New Burlap Cuttings 4.75 " 5.00
Heavy Baling Bagging 4.00 " 4.25
Paper Mill Bagging.. 2.50 " 3.00
No. 2 Roofing Bagging 1.35 " —
*OPA Maximum Price.

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—
New Light Prints. .04½ @ .04¾
Fancy Percales.... .04¼ " .05
New White No 1. .06¾" .07
New Light Flannelettes ..... .05½" .06
Canton Flannels, Bleached ..... .06 " .06¼
Underwear Cutters, Bleached ..... .06¼" .06¾
Underwear Cutters, Unbleached ..... .05¼" .06
Silesias No. 1..... .06 " .06¾
New Black Silesias.. .03 " .03½
Red Cotton Cuttings .03½" .04
Soft Unbleached ... .06½ " .06¾
Blue Cheviots .... .05½ " .06
Fancy ..... .02¾" —
Washable ..... .02¾" —
Khaki Cuttings .... .02¾" .03
O. D. Khaki..... .03½" .03¾
Corduroy ..... .03¼" .03½
New Canvas ..... .06¼" .06¾
B. V. D. Cuttings... .06¼" .06¾

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—
Repacked ..... 3.80 @ —*
Miscellaneous .... 3.20 " —*
White No. 2—
Miscellaneous .... 2.65 " —*
Twos and Blues, Repacked ..... 2.20 " —*
Old Blue Overalls... 2.25 " 2.50
Thirds and Blues, Repacked ..... 2.20 " —*
Miscellaneous ..... 1.80 " —*
Black Stockings .... 3.50 " 4.00
Roofing Stock—
No. 1 ..... 1.55 " —*
No. 2 ..... 1.45 " —*
No. 3 ..... 1.35 " —*
No. 4 ..... 1.35 " —*
No. 5, Quality A.. 1.35 " —*
Quality B.. 1.20 " —*
Quality C.. .95 " —*
* Old Manila Rope.. 5.75 " —
*OPA Maximum Prices.

Foreign Rags

(F. o. b Boston)

Canvas .....(nominal)
Dark Cottons .....(nominal)
Dutch Blues .....(nominal)
New Checks and Blues..(nominal)
Old Fustians .....(nominal)
Old Linsey Garments....(nominal)
New Silesias .....(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)
OPA Maximum Prices

Shavings—
No. 1 Hard White Envelope Cuts, one cut ..... 1.37½" —
No. 1 Hard White Shavings, unruled. 2.87½" —
No. 1 Soft White Shavings ..... 2.50 " —
No. 1 White Ledger 2.17½" —
No. 1 Heavy Books & Magazines ..... 1.67½" —
White Blank News.. 1.65 " —
Mixed Kraft Env. & Bag Cuttings... 2.75 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
Overissue News .... .85 " —
No. 1 News..... .75 " —
No. 1 Mixed Paper.. .70 " —
No. 1 Roofing Rags. 1.55 " —
No. 1 Roofing Bags. 1.45 " —
Misc. ..... 2.15 " —
No. 1 White Ledger. 2.17½" —
No. 2 Ledger, colored 1.87½" —
No. 1 Heavy Books & Magazines .... 1.67½" —
Overissue Magazines. 1.67½" —
New Manila Envelope Cuttings ..... 2.65 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
No. 1 Mixed Paper. .70 " —
Box Board Cuttings. .72½" —
Kraft Corrugated Cuttings ..... 2.25 " —
Old Corrugated Containers ..... 1.15 " —
Overissue News..... .85 " —
No. 1 News..... 1.00 " —

[PUMP TIPS FROM ALLIS-CHALMERS—ONE IN A SERIES]

How to make SHAFTS Last Longer . . .

The Allis-Chalmers "Electrifugal" Pump is a unit-designed pump . . . with both impeller and motor mounted on one shaft and in one frame. The next time you need new pumps . . . look into the extra efficiency, ruggedness and long life of Allis-Chalmers centrifugal pumps . . . the "Electrifugal" . . . and all types for every purpose.

WHERE YOU HAVE an Allis-Chalmers "Electrifugal" Pump . . . shaft and rotor pictured at left . . . you don't have an alignment problem—because *both* impeller and rotor are mounted on *one* shaft.

However, many pumps in use today are coupled to a separate motor, and how well the two are aligned has a lot to do with how long the shaft lasts . . . and the pump and coupling too . . . because misalignment starts all three fighting each other!

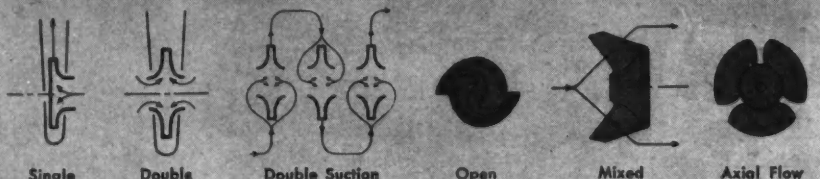
Here are a few tips which will help you get longer life out of pump shafts:

- See that pump and motor coupling flanges are parallel . . . both vertically and axially . . . and that they are kept that way!
- If misalignment recurs frequently, check foundations, piping, bolted connections.
- In the case of boiler feed or other pumps which reach high operating temperatures, be sure that alignment of motor and pump is checked after *both* have been operating. Otherwise they might develop misalignment from unequal expansion.
- If you haven't done so already, send for your *free* copy of "Handbook for Wartime Care of Centrifugal Pumps". Contains *no* advertising. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WISCONSIN. A 1707

Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.

ALLIS-CHALMERS PUMPS

Allis-Chalmers builds all types and variations of pumps shown at right. Capacities from 10 to 150,000 gpm—heads to 2500 lbs.



HELPS BEARINGS "Bear the Heat"

SOLNUS OILS

Stop Gumming and Caking in Corrugator Roll Bearings

Lubrication is a number one problem when roller bearings operate under excessive heat. That's what a New England manufacturer of corrugated containers discovered on the corrugators and precision cut-off machines in his plant.

Gumming and Caking of the lubricants in and around the bearings caused considerable bearing trouble, excessive maintenance and a dirty condition surrounding the machines. Average roll temperatures were 340° F. and the heat radiated created abnormal operating conditions for these bearings.

Two years ago, this manufacturer asked a Sun Engineer to study these conditions and recommend a lubricant that would stand up. A Solnus Oil and a Sun H. D. Gun Grease were specified and applied. Since then there has been no trouble.

All residue is eliminated from the bearings and the new lubricants did not cake or gum. Substantial savings have been made in both cost of lubricants and in maintenance. The Sun H. D. Gun Grease feeds much better from an electric gun than the grease formerly used.

This experience is just one among thousands resulting from the right combination of Sun Engineering experience and Sun Lubricant quality. When you have a lubrication problem call in a Sun Oil Engineer. And if you want to know more about lubricants write for your free copy of the new lubrication manual "How To Get The Most Out Of Your Lubricants."

SUN OIL COMPANY • Philadelphia 3, Pa.

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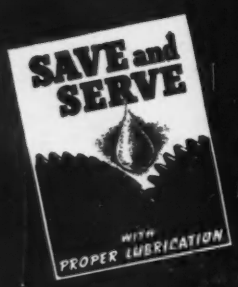

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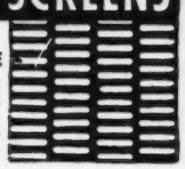

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K-121-B and K-C-2
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J-22

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WANTED—Plant Engineer experienced in design construction, maintenance and operation of Fourdrinier paper mill. Good opportunity for the right party. In reply state experience and salary expected. All replies will be held strictly confidential. Address Box 44-448 care Paper Trade Journal. J-6

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SUPERINTENDENT—Asst. Supt.—Rag Bonds and Ledgers. Ten years with leading manufacturer. Understands de-inking. Excellent educational background. Address Box 44-381 care Paper Trade Journal. J-29

EXPORT MANAGER — American paper man with broad business and residential experience in Latin America, familiar with export procedures and shipping, desires position as export manager with manufacturer or concern exporting paper. Address Box 44-408 care Paper Trade Journal. J-29

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CHEMICAL TECHNOLOGIST — Graduate in chemistry and Pulp and Paper Technology. Experience in soda pulping, de-inking, development and manufacture of safety, technical and rag papers. Age 29. Excellent record and references. Address Box 44-401 care Paper Trade Journal. J-29

SUPERINTENDENT — 20 years experience in paper bag conversion of grocery, sacks and analine or oil ink printed specialty bags. Capable of handling all bag shop problems. Thorough experience in supervision of help, maintenance and repairing of machines. Address Box 44-372 care Paper Trade Journal. J-29

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Middletown, Ohio J-6

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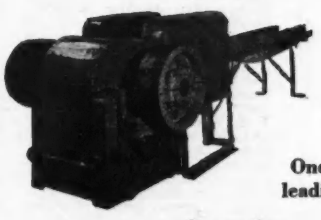

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Shartle Brothers Machine Co.
Timken Roller Bearing Co.
Valley Iron Works Co.
T. B. Wood's Sons Company

BEATERS & JORDANS
The Appleton Machine Co.
Black-Clawson Company
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
J. J. Ross Company
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works

BED PLATES
American Manganese Steel Division of the Amer. Brake Shoe Co.
Bahr Brothers Mfg. Co.
Dilts Machine Works Inc.
Downingtown Mfg. Co.
Farrel-Birmingham Co., Inc.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Simonds Worden White Co.
Valley Iron Works Co.

BELTING
Allis-Chalmers Mfg. Co.
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
J. E. Rhoads & Sons
United States Rubber Co.
T. B. Wood's Sons Company
Worthington Pump & Machinery Corp.

BLEACHING APPARATUS
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
Perkins & Sons, Inc., B. F.
Moore & White Co.
Niagara Alkali Co.
Noble & Wood Machine Co.
Pennsylvania Salt Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

BLOWERS
Ingersoll-Rand Co.

BLOW PIPES & PITS
Montague Machine Co.
Moore & White Co.
Murray Mfg. Co., D. J.
Walworth Company
Valley Iron Works Co.

BOTTOMS
Harrington & King Perforating Co.
Kalamazoo Tank & Silo Co.

CALENDERS
Black-Clawson Company
Downingtown Mfg. Co.
Farrel-Birmingham Co., Inc.
Lobdell Car Wheel Co.
Moore & White Co.
Perkins & Son, Inc., B. F.
The Norwood Engineering Company
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
Waldron Corp., John

CALIPERS
Walker-Goulard-Plehn Co.

CASTINGS
American Manganese Steel Division of the Amer. Brake Shoe Co.
Appleton Machine Co.
Black-Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
The Frederick Iron & Steel Co.
Grinnell Company
Hamblet Machine Co.
E. D. Jones & Sons Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Union Machine Company
Union Screen Plate Co.
Valley Iron Works Co.
Walworth Company

CENTRIFUGAL MACHINERY
Bird Machine Co.
De Laval Steam Turbine Co.
Nichols Engrg. & Research Corp.
Ross J. O. Eng. Co.
Shartle Brothers Machine Co.

CHEMICALS
Aktivin Corporation
Amer. Cyanamid & Chem. Corp.
Ansul Chemical Co.
Calco Chemical Co.
Diamond Alkali Co.
Dispersion Process Inc.
Dow Chemical Company
E. I. du Pont de Nemours & Co., Inc.
General Dyestuff Corp.
Geigy Co., Inc.
Gottesman & Co.
Heyden Chemical Corp.
Hooker Electrochemical Company
The Mathieson Alkali Works, Inc.
Monsanto Chemical Company
The Neville Company
Naugatuck Chemical Div. of U. S. Rubber Co.
Niagara Alkali Company
Paper Makers Chemical Department, Hercules Powder Co.
Pennsylvania Salt Mfg. Co.
Pittsburgh Plate Glass Co., Columbia Chemical Division
Solvay Sales Corp.
Stauffer Chemical Company
United States Rubber Co.
Witco Chemical Co.
Wyandotte Chemicals Corp.

CLEANING MATERIALS
Amer. Cyanamid & Chem. Corp.
Bird Machine Co.
E. I. du Pont de Nemours & Co., Inc.
Oakite Products, Inc.
Paper Makers Chemical Department, Hercules Powder Co.
Magnus Chemical Co.
Nichols Engrg. & Research Corp.
Pennsylvania Salt Mfg. Co.
Philadelphia Quartz Co.
Pittsburgh Plate Glass Co., Columbia Chemical Division
Solvay Sales Corp.
Wyandotte Chemicals Corp.
J. B. Ford Division

CLUTCHES
Appleton Machine Co.
Black-Clawson Company
Hudson Sharp Machine Company
Farrel-Birmingham Co.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Stearns Magnetic Mfg. Co.
Valley Iron Works Co.
T. B. Wood's Sons Company

COATING MACHINERY
Hudson Sharp Machine Company
Moore & White Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.
Waldron Corporation, John
Weber, Herman G.

COMPRESSORS
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Ingersoll-Rand Co.
Nash Engineering Co.
Worthington Pump & Machinery Corp.

CONDENSERS
Ingersoll-Rand Co.

CONSULTING ENGINEERS
W. H. L. D. Betz
W. R. Cliffe
Ferguson, Hardy S.
Hardy, George P.
Johnson & Wierk, Inc.
L. I. M. E.
Merritt-Chapman & Scott Corp.
Main, Inc., Chas. T.
O'Donoghue, Roderick
J. E. Sirrine & Co.
Stone & Webster Engrg. Corp.

CONVEYORS
Black-Clawson Company
Murray, D. J. Mfg. Co.
Ross Engineering Corp., J. O.

COOKING PROCESSES
Kinsley Chemical Co.

CORES
Elixman Paper Co.
Sonoco Products Co.
Rodney Hunt Machine Co.
Montague Machine Co.
Smith & Winchester Mfg. Co.
Walker-Goulard-Plehn Co.

COUPLINGS
Black-Clawson Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co., Inc.
The Frederick Iron & Steel
E. D. Jones & Sons Co.
Moore & White Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Waldron Corp., John
Westinghouse Electric Mfg. Co.
T. B. Wood's Sons Company

CUTTERS
Thomas W. Hall Co.
Noble & Wood Mch. Co.
Perkins & Son, Inc., B. F.
The Smith & Winchester Mfg. Co.
Taylor Stiles & Co.

DAMPENERS
The Norwood Engineering Company
Perkins & Son, Inc., B. F.
Valley Iron Works Co.

DE-INKING
Kinsley Chemical Co.
O'Donoghue, Roderick

DIGESTERS
H. K. Porter Company Inc.
Pusey & Jones Corp.

DOCTORS
Bird Machine Company
Black-Clawson Company
Downingtown Mfg. Co.
Lobdell Carwheel Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DOCTOR BLADES
Black-Clawson Company
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Simonds Worden White Co.
Shartle Brothers
United States Rubber Co.
Westinghouse Electric & Manufacturing Company

DRIERS
Black-Clawson Company
Murray Mfg. Co., D. J.
J. J. Ross Company
Ross, J. O. Engineering Corp.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Waldron, Corp., John

DRIVES
Allis-Chalmers Mfg. Co.
Bird Machine Co.
Black-Clawson Company
Davis, Frank H., Co.
Dilts Machine Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
General Electric Company
W. A. Jones Fdy. & Mch. Co.
Montague Machine Co.
Moore & White Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Norwood Engrg. Co.
Pusey Jones Corp.
J. J. Rose Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Westinghouse Electric & Manufacturing Company

DUSTERS
Appleton Machine Co.
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Moore & White Co.
Noble & Wood Machine Co.
Norwood Engrg. Co.
D. J. Murray Mfg. Co.

DYESTUFFS
Calco Chemical Co.
Ciba Company
E. I. du Pont de Nemours & Co.
Geigy Co., The
General Dyestuff Corp.
National Aniline Division, Allied Chemical & Dye Corp.
Paper Makers Chemical Department, Hercules Powder Co.
C. K. Williams & Co.
Witco Chemical Co.

EVAPORATORS
Black-Clawson Company
Murray, D. J., Mfg. Co.

EXTRACTORS
Bird Machine Company
Dilts Machine Works
Downingtown Manufacturing Co.
E. D. Jones & Sons Co.
The Noble & Wood Machine Co.
Valley Iron Works Co.

FANS
General Electric Co.
B. F. Perkins & Son, Inc.
Ross Engineering Co., J. O.

FEEDERS
Merrick Scale Mfg. Co.
Leeds & Northrup
Wallace & Tiernan

FELTS
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Bloomfield Woolen Co.
Bulkley, Dunton Pulp Co. Inc.
Draper Bros. Co.
Fitchburg Duck Mills
Huyck & Son, F. C.
Lockport Felt Co.
Mt. Vernon-Woodbury Mills, Inc.
Morey Paper Mill Supply Co.
Orr Felt & Blanket Co.
Shuler & Benninghofen
Waterbury Felt Co.
Woodward, Baldwin & Co.

FELT GUIDES
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

FILLERS
American Colloid Co.
Amer. Cyanamid & Chem. Corp.
International Pulp Co.
W. H. Loomis Talc Corp.
Union Talc Co.
Vanderbilt Co., R. T.
Wishnick-Tumpeer, Inc.

FILTERS
Improved Paper Machy. Corp.
Moore & White Co.
The Norwood Engineering Company
Oliver-United Filters Inc.
J. O. Ross Engrg. Corp.
Worthington Pump & Mchy. Corp.
Witco Chemical Co.

FLOORING, GRATING & TREADS
Hendrick Mfg. Co.
Klemp, W. F., Co.
Norton Co.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
Robinson, C. P.
United States Rubber Co.

FORMING MACHINES
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Noble & Wood Machine Co.
Oliver United Filters
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

GATES (Penstocks and water wheels)
Rodney Hunt Machine Co.

GEARS
American Manganese Steel Div. of the Amer. Brake Shoe Co.
Black-Clawson Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

WHERE TO BUY

GRINDERS
Covel-Hanchett Co.
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Samuel C. Rogers and Company
The Sandy Hill Iron & Brass Works

GRINDING WHEELS
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Simonds Worden White Co.
United States Rubber Co.

HEATING, VENTILATING AND AIR CONDITIONING
The Appleton Machine Co.
Armstrong Machine Works
E. D. Jones & Sons Co.
General Electric Co.
Grinnell Company
Leeds & Northrup
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
Ross Engineering Corp., J. O.
Shartle Brothers Machine Co.
Valley Iron Works Co.
Worthington Pump & Mchy. Corp.

HEAT-TREATING FURNACES
Leeds & Northrup Company

HOISTS
Appleton Machinery Co.
Dilts Machine Works
Rodney Hunt Machine Co.
Ingersoll-Rand Co.
E. D. Jones & Sons Co.

HOSE (Air, Water, Suction, etc.)
The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan Inc.
United States Rubber Co.

INSTRUMENTS
N. P. Bowsher
The Foxboro Company
General Electric
Leeds & Northrup Company
National Technical Laboratories
Taylor Instrument Cos.
Westinghouse Electric & Manufacturing Company
Wilkens-Anderson Co.

JORDAN FILLINGS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

KNIVES
Black-Clawson Company
Dilts Machine Works, Inc.
Hamblet Machine Co.
E. D. Jones & Sons Co.
Simonds Warden White Co.
Valley Iron Works Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
W. H. & L. D. Betz
Dilts Machine Works
E. D. Jones & Sons Co.
Leeds & Northrup Company
National Technical Laboratories
Noble & Wood Machine Co.
Taber Instrument Co.
Taylor Instrument Companies
Valley Iron Works Co.

LAY BOYS
Hamblet Machine Co.
Moore & White Co.
Shartle Brothers

LOCOMOTIVES
H. K. Porter Company Inc.

LUBRICANTS
Gulf Oil Corporation
Gulf Refining Co.
Sinclair Refining Co.
Socony-Vacuum Oil Co., Inc.
Sun Oil Company
Tide Water Associated Oil Co.

MICROMETERS & CALIPERS
Farrel-Birmingham Co.
Montague Machine Co.
Lobdell Car Wheel Co.
Walker-Goulard-Plehn Co.

MIXERS
Eastern Engineering Co.
H. K. Porter Company Inc.

MOTORS AND GENERATORS
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Co.
Ingersoll-Rand Co.
Reliance Electric & Engrg. Co.
Westinghouse Electric & Manufacturing Company

PACKING BOXES
Johnson Corporation
Shartle Brothers Machine Co.

PACKING
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
United States Rubber Co.

PAPER MACHINES
Black-Clawson Company
Downingtown Mfg. Co.
Thomas W. Hall Co.
Moore & White Co.
Pusey & Jones
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester

PAPER MACHINE HOODS
Ross Engineering Corp., J. O.

PAPER MACHINE SLICES
Black-Clawson Company
E. D. Jones & Sons Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER TUBE MACHINERY
Dietz Machine Works
Thomas W. Hall Co.
Hudson Sharp Machine Company
Langston Co., Samuel M.

PASTING MACHINES
Black-Clawson Company
Davis, Frank H., Co.
Murray, D. J., Mfg. Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John

PERFORATED METAL
Allis-Chalmers Mfg. Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.

PIPE
The American Rolling Mill Co.
Black-Clawson Company
Crane Company
Grinnell Company
Shartle Brothers Machine Co.
Taylor Forge & Pipe Works
Walworth Company

PLATERS
The Norwood Engineering Company
Perkins & Son, Inc., B. F.

PLATES
The American Rolling Mill Co.
Black-Clawson Company
Hendrick Mfg. Co.
Klemp, W. F., Co.
J. O. Ross Engrg. Corp.
Shartle Brothers Machine Co.
Timken Roller Bearing Co.

PLUGS
Black-Clawson Company
E. D. Jones & Sons Co.
The Noble & Wood Machine Co.
The Richardson Economy Plug Co.
Shartle Brothers Machine Co.

PRESSES
Black-Clawson Company
Farrel-Birmingham Co.
Dietz Machine Wks.
Thomas W. Hall Co.
Hudson-Sharp Machine Co.
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Shartle Brothers
Valley Iron Works Co.
Waldron Corp., John
Weber, Homer G.

PULLEYS AND SHAFTS
Allis-Chalmers Mfg. Co.
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Montague Machine Co.
D. J. Murray Mfg. Co.
The Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Stearns Magnetic Mfg. Co.
Valley Iron Works Co.
T. B. Wood's Sons Company

PULPS
Andersen Co., J
Bulkley, Dunton Pulp Co. Inc.
Gotteaman & Co., Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.

PUMPS
Allis-Chalmers Mfg. Co.
Black-Clawson Company
Dorr Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Frederick Iron and Steel Co.
Ingersoll-Rand Co.
Johnson Corp.
Lombard Governor Corp.
Moore & White Co.
Nash Engineering Co.
Noble & Wood Machine Co.
Paper Converting Mch. Co.
Quimby Pump Co. Div. of H. K. Porter Company, Inc
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Warren Steam Pump Co.
Worthington Pump & Machinery Corp.

RAG THRASHERS
The Norwood Engineering Company

REAM COUNTERS
Hamblet Machine Co.

RECOVERY SYSTEMS
Bulkley, Dunton Pulp Co. Inc.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusey & Jones
Ross Engineering Corp, J. O.
Valley Iron Works Co.

REELS
Black Clawson Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Hudson Sharp Machine Company
Montague Machine Co.
Moore & White Co.
The Norwood Engineering Company
Paper Converting Mch. Co.
Rodney Hunt Machine Co.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.

REFINERS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.
Dilts Machine Works
The Hermana Manufacturing Co.
E. D. Jones & Sons Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works

REGULATORS
Allis-Chalmers Mfg. Co.
Armstrong Machine Works
Bird Machine Company
The Brown Instrument Co.
The Foxboro Company
Jones, E. D., & Sons Co.
General Electric Co.
Johnson Corp.
Leeds & Northrup Company
National Technical Laboratories
Noble & Wood Machine Co.
Shartle Brothers
Taylor Instrument Companies
Wallace & Tiernan
Westinghouse Electric & Manufacturing Company

RESINS
The Neville Company
The Resinous Products & Chemical Co.

ROLLS
Appleton Machine Co.
Black-Clawson Company
Downingtown Mfg. Co.
Farrel-Birmingham Co.
Improved Paper Machy. Corp.
Lobdell Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
Perkins, B. F., & Sons Co.
Pusey & Jones Corp.
Rochlen Engraving Co.
J. J. Ross Company
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Sinclair Co.
Smith & Winchester Mfg. Co.
Stearns Magnetic Mfg. Co.
United States Rubber Co.
Valley Iron Works Co.
Waldron Corp., John

ROLL STANDS
Cameron Machine Co.
Improved Paper Machy. Corp.
Johnstone Eng. & Machine Co.
Moore & White Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.

SATURATING MACHINES
Black-Clawson Company
Moore & White Co.
Noble & Wood Machine Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

SCALES
Merrick Scale Mfg. Co.

SCREEN PLATES
Fitchburg Screen Plate Co.
Morey Paper Mill Supply Co.
Union Machine Co.
Union Screen Plate Co.

SCREENS
Allis-Chalmers Mfg. Co.
Appleton Wire Works
Appleton Machine Co.
Bird Machine Company
Carthage Machine Co.
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Harrington & King Perforating Co.
Hendrick Manufacturing Co.
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SHEET MACHINES
Thomas W. Hall Co.
The Hermana Manufacturing Co.
Noble & Wood Machine Co.
Rotogravure Engrg. Co.
Valley Iron Works Co.

SHOWER PIPES
Bird Machine Company
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Moore & White Co.
Shartle Bros. Mach. Co.
Smith & Winchester Mfg. Co.

SHREDDERS
Bauer Brothers Co.
Carthage Machine Co.

SILICATE OF SODA
Philadelphia Quartz Co.

SIZING
American Cyanamid & Chemical Co.
Black-Clawson Company
The Dow Chemical Co.
du Pont, E. I., de Nemours & Co.
Paper Makers Chemical Department, Hercules Powder Co.
Socony-Vacuum Co.
Philadelphia Quartz Co.

SIZING PROCESS
Bulkley, Dunton Pulp Co. Inc.
Process Engineers

SLITTERS
Black-Clawson Company
Cameron Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Thomas W. Hall Co., Inc.
Hamblet Machine Co.
Hudson Sharp Machine Company
Johnstone Eng. & Machine Co.
Langston Co., Samuel M.
Moore & White Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Simonds Worden White Co.
Smith & Winchester Mfg. Co.
Waldron Corp., John

SPECIAL MACHINERY
Appleton Machine Co.
Downingtown Mfg. Co.
Farrell-Birmingham Co.
Hamblet Machine Co.
The Hermana Manufacturing Co.
Hudson Sharp Machine Company
Improved Paper Machy Corp.
E. D. Jones & Sons Co.
Merrick Scale Mfg. Co.
Montague Machine Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Rodney Hunt Machine Co.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

STARCH
American Cyanamid & Chemical Corp.
Clinton Co.
National Starch Products, Inc.
Stein, Hall & Co., Inc.

WHERE TO BUY

STEAM SPECIALTIES
Johnson Corp.
Shartle Bros. Mch. Co.
Stickle Steam Specialties Co.

STRAPPING & STRAPPING MACHINES
Acme Steel Co.
The Stanley Works

STUFF CHESTS
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SUCTION BOXES
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co
Westinghouse Electric & Manufacturing Company

SULPHUR
American Cyanamid & Chemical Corp.
Stauffer Chemical Company
Texas Gulf Sulphur Co.
Witco Chemical Company

SULPHUR BURNERS
Valley Iron Works Co.

TALC
W. H. Loomis Talc Corp.
Union Talc Company

TANKS
Hendrick Mfg. Co.
E. D. Jones & Sons Co.
Kalamazoo Tank & Silo Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
The Noble & Wood Machine Co.
H. K. Porter Company Inc.
Rodney Hunt
J. O. Ross Engrg. Corp.
Shartle Brothers Machine Co.
United States Rubber Co.
Waldron Corp., John

TESTERS
Perkins & Son, Inc., B. F.
W. & L. B. Gurley
W. H. & L. D. Betz
Leeds & Northrup Company
National Technical Laboratories
Wallace & Tiernan Co., Inc.
Wilkens-Anderson Co.

THICKENERS, DECKERS & SAVEALLS
Bird Machine Company
Bulkley, Dunton Pulp Co. Inc.
Carthage Machine Co.
Dilts Machine Works
Dorr Co.
Downingtown Mfg. Co.
Improved Paper Machy. Corp
Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

TITANIUM
Krebs Pigment and Color Corp
Titanium Pigment Co.
United Color & Pigment Co
R. T. Vanderbilt Co.
Witco Chemical Company

TOOLS
Acme Steel Company
Ingersoll-Rand Co.
The Stanley Works
Walworth Company

TRANSMISSION MACHINERY
Allis-Chalmers Mfg. Co.
Appleton Machine Co.
Black-Clawson Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co.
Rodney Hunt Mach. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Timken Roller Bearing Co.
Valley Iron Works Co.
Westinghouse Elec. & Mfg. Co.
T. B. Wood's Sons Company
Worthington Pump & Machinery Corp.

TRAPS
Armstrong Machine Works
Crane Co.
Grinnell Company
Johnson Corporation
Shartle Bros. Mch. Co.

TUBS
Noble & Wood Machine Co.
Rodney Hunt Machine Co.
Shartle Brothers
Valley Iron Works Co.

TURBINES
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Company
Hunt, Rodney, Mach. Co.
Westinghouse Electric & Manufacturing Company
Worthington Pump & Machinery Corp

USED EQUIPMENT
Frank H. Davis Company
Gibbs-Brower Co.
Thomas W. Hall Co.
Noble & Wood Machine Co.
Rotogravure Engrg. Co.
J. J. Ross Company
Shartle Brothers Machine Co

VALVES
Crane Company
Dilts Machine Works
The Foxboro Company
E. D. Jones & Sons Co.
Kennedy Valve Mfg. Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
William Powell Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co
Taylor Instrument Companies
Valley Iron Works Co.
Walworth Company

VATS & VAT PARTS
Union Machine Co.
Union Screen Plate Co

WASHERS
Bird Machine Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Rodney Hunt Machine Co.
Shartle Brothers Machine Co.
Valley Iron Works Co.

WATER CONDITIONING EQUIPMENT
Bulkley, Dunton Pulp Co. Inc.
Worthington Pump & Machinery Corp.

WAXES
Pennotex Oil Corp.

WAXING MACHINERY
Black-Clawson Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

WELDING EQUIPMENT
Allis-Chalmers Mfg. Co.
General Electric Company
Walworth Company
Westinghouse Electric & Manufacturing Company

WET MACHINES
Black-Clawson Co.
Carthage Machine Co.
Downingtown Mfg. Co.
Improved Paper Machy. Corp
Moore & White Co.
Montague Machine Co.
Noble & Wood Machine Co
Pusey & Jones Corp.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co
Valley Iron Works Co.

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Cameron Machine Co.
Dietz Machine Works
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Thomas W. Hall Co.
Hudson-Sharp Mach. Co.
Langston Co., Samuel M.
Johnstone Eng. & Machine Co
Montague Machine Co.
Moore & White Co.
Paper Converting Mch. Co.
Potdevin Machine Co.
Pusey & Jones Corp.
Rotogravure Engrg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
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Waldron Corp., John

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Black-Clawson Company
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Cheney Bigelow Wire Works
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International Wire Works
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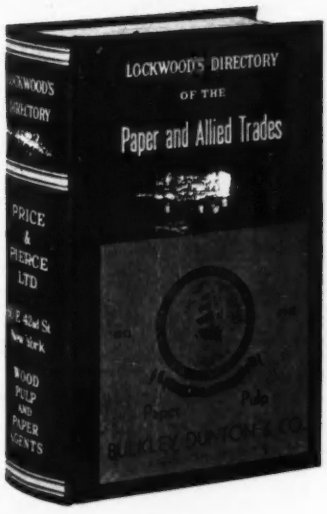

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